**3GPP TSG RAN WG1 #105 R1-21xxxxx**

**e-Meeting, May 10th – 27th, 2021**

**Agenda Item: 6.1**

**Source: Moderator (ZTE)**

**Title: [105-e-LTE-6.1CRs-03] Email discussion/approval on R1-2105398 and R1-2105940**

**Document for: Discussion and Decision**

# Introduction

This document provides discussion on clarification on NPUSCH postponement for NB-IoT:

[105-e-LTE-6.1CRs-03] Email discussion/approval on R1-2105398 and R1-2105940 by May 24 - Huiying (ZTE)

# Discussion

Regarding NPUSCH postponement clarification, the following Reason for change, Summary of change and Consequences if not approved are proposed in R1-2105398 [1].

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| ***Reason for change:*** | In Clause 10.1.3.6 of TS36.211, the following triggering cases for NPUSCH postponement are not included in Rel-15 specification:* Case a: If NPUSCH is collided with any configured TDD NPRACH resource in non-anchor carrier;
* Case b: If NPUSCH is collided with any configured FDD NPRACH format 2 resource in non-anchor carrier if *mixedOperationMode* is not supported;
* Case c: If NPUSCH is collided with any configured FDD NPRACH format 0/1/2 resource in non-anchor carrier if *mixedOperationMode* is supported

In addition, *NPRACH-ConfigSIB-NB* in the 1st bullet may include NRPACH resources for NPRACH format 0/1/2 and EDT NPRACH in FDD anchor carrier. If the UE does not support FDD NPRACH format 2 and/or EDT NPRACH, it cannot identify the corresponding NPRACH resources and will not do NPUSCH postponement when the collision happens. Clarification is needed for this case. |
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| ***Summary of change:*** | 1. Adding the missing triggering cases in non-anchor carriers.
2. Clarifying the triggering cases in anchor carriers.
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| ***Consequences if not approved:*** | In non-anchor carrier, for TDD NPRACH or FDD NPRACH format 2 (if *mixedOperationMode* is not supported) or FDD NPRACH format 0/1/2 for *mixedOperationMode*, the NPUSCH will not be postponed when the collision happens. Thus, the NPRACH resources will be seriously interfered by NPUSCH transmission.In anchor carrier, NPUSCH postponement rule is not clear for the UE not supporting FDD NPRACH format 2 or EDT. |

In R1-2105940 [2], the cases not captured in current spec are summarized in Table 1:

**Table 1 NPRACH resources in Rel-15**

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| **Case #** | **NPRACH preamble** | **Carrier** | **UE capability** | **RRC Configuration** |
| 1 | Legacy(i.e. Format 0/1) | Non-anchor | *multiCarrier-NPRACH* and *mixedOperationMode* | *SystemInformationBlockType22 > ul-ConfigListMixed-r15* |
| 2 | Format 2 | Non-anchor | *multiCarrier-NPRACH* and *nprach-Format2* | *SystemInformationBlockType23-NB-r15 > ul-ConfigList-v1530 > nprach-ParametersListFmt2-r15* |
| 3 | Format 2 | Non-anchor | *multiCarrier-NPRACH*, *mixedOperationMode* and *nprach-Format2* | *SystemInformationBlockType23-NB-r15 > ul-ConfigListMixed-v1530 > nprach-ParametersListFmt2-r15* |
| 4 | Format 2 | Anchor | *nprach-Format2* | *SIB2 > RadioResourceConfigCommonSIB-NB-r13 > nprach-ParametersListFmt2-r15* |
| 5 | TDD | Anchor | *[NOTE1]* | *SIB2 > RadioResourceConfigCommonSIB-NB-r13 > nprach-ParametersListTDD-r15* |
| 6 | TDD | Non-anchor | *multiCarrier-NPRACH**[NOTE1]* | *SystemInformationBlockType22 > ul-ConfigCommonListTDD-NB-r15>* *nprach-ParametersListTDD-r15* |
| *NOTE1: No explicit capability for TDD NPRACH* |

**Question: Do you agree above 6 cases of NPRACH resources in Table 1 to be added into triggering cases for NPUSCH postponement in section 10.1.3.6 of TS 36.211?**

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| **Companies** | **Comments** |
| Ericsson | We are still not fully convinced of this clarification, because for example the cases when the UE capability is not available at the eNodeB is being left aside.That is, in our view one case that has not been covered in Table 1 is when the UE capability is not available at the eNodeB. That is, when a UE performs a random-access procedure in which case the NPRACH resource is implicitly indicated, therefore if a clarification is to be performed we suggest to the incorporate the following case:...- any NPRACH resource utilized by a UE that performs a random access procedure on an anchor or non-anchor carrier |
| Lenovo, MotoM | We agree the above cased needed to be considered. |
| ZTE, Sanechips | We are fine to add the case Ericsson proposed if companies think ‘NPRACH resource implicitly indicated’ is not included in the spec. |

To address above triggering cases issue, draft TPs to TS 36.211 are proposed in [1] and [2].

In [1], following draft TP (***TP1***) is proposed:

***TP1:***

**10.1.3.6 Mapping to physical resources**

**<Unchanged parts are omitted>**

 If a mapping to  slots or a repetition of the mapping contains a resource element which overlaps with

- any configured NPRACH resource according to *nprach-ParametersList or nprach-ParametersListTDD* in *SystemInformationBlockType2-NB*, or

- any configured NPRACH resource according to *nprach-ParametersListFmt2* in *SystemInformationBlockType2-NB* and if the UE indicates *nprach-Format2* as supported, or

- any configured NPRACH resource according to *nprach-ParametersList* or *nprach-ParametersListTDD* contained in *ul-ConfigList* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* as supported, or

-    any configured NPRACH resource according to *nprach-ParametersListFmt2* contained in *ul-ConfigList* in *SystemInformationBlockType23-NB* and if the UE indicates*multiCarrier-NPRACH* and *nprach-Format2* as supported, or

- any configured NPRACH resource according to *nprach-ParametersList* contained in *ul-ConfigListMixed* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* and *mixedOperationMode* as supported, or

-     any configured NPRACH resource according to *nprach-ParametersListFmt2* contained in *ul-ConfigListMixed* in *SystemInformationBlockType23-NB* and if the UE indicates*multiCarrier-NPRACH, mixedOperationMode* and *nprach-Format2* as supported, or

- any configured NPRACH resource configured for Early Data Transmissionand if the NPUSCH transmission is during an Early Data Transmission procedure [12, Clause 7.3b],

then,

- for  the NPUSCH transmission in overlapped slots is postponed until the next  slots not overlapping with any configured NPRACH resource.

- for  the NPUSCH transmission in overlapped  slots is postponed until the next  slots starting with the first slot satisfying $n\_{s}mod 2=0$ $n\_{s}mod 2=0$and not overlapping with any configured NPRACH resource.

**<Unchanged parts are omitted>**

In [2], following draft TP (**TP2**) is proposed:

***TP2:***

**10.1.3.6 Mapping to physical resources**

**<Unchanged parts are omitted>**

If a mapping to  slots or a repetition of the mapping contains a resource element which overlaps with

- any configured NPRACH resource according to *NPRACH-ParametersList* in *SystemInformationBlockType2-NB*, or

- any configured NPRACH resource according to *nprach-ParametersList* given by *ul-ConfigList* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* as supported, or

- any configured NPRACH resource according to *nprach-ParametersList* given by *ul-ConfigListMixed* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* as supported, or

- any configured NPRACH resource according to *nprach-ParametersListFmt2* in *SystemInformationBlockType2-NB* and if the UE indicates *nprach-Format2* as supported, or

- any configured NPRACH resource according to *nprach-ParametersListFmt2* given by *ul-ConfigList* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* as supported and if the UE indicates *nprach-Format2* as supported, or

- any configured NPRACH resource according to *nprach-ParametersListFmt2* given by *ul-ConfigListMixed* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* as supported and if the UE indicates *nprach-Format2* as supported, or

- any configured NPRACH resource according to *nprach-ParametersListTDD* in *SystemInformationBlockType2-NB*, or

- any configured NPRACH resource according to *nprach-ParametersListTDD* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* as supported, or

- any configured NPRACH resource configured for Early Data Transmissionand if the NPUSCH transmission is during an Early Data Transmission procedure [12, Clause 7.3b],

then,

- for  the NPUSCH transmission in overlapped slots is postponed until the next  slots not overlapping with any configured NPRACH resource.

- for  the NPUSCH transmission in overlapped  slots is postponed until the next  slots starting with the first slot satisfying $n\_{s}mod 2=0$ $n\_{s}mod 2=0$and not overlapping with any configured NPRACH resource.

**<Unchanged parts are omitted>**

For **TP2**, Moderator has following two comments:

1. Regarding “ any configured NPRACH resource according to *nprach-ParametersListFmt2* given by *ul-ConfigList* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* as supported and if the UE indicates *nprach-Format2* as supported”,

*SystemInformationBlockType22-NB* is not correct since FDD NPRACH Format 2 in non-anchor carrier is included in *SystemInformationBlockType23-NB not SystemInformationBlockType22-NB.*

1. Regarding “any configured NPRACH resource according to *nprach-ParametersListFmt2* given by *ul-ConfigListMixed* in *SystemInformationBlockType22-NB* and if the UE indicates *multiCarrier-NPRACH* as supported and if the UE indicates *nprach-Format2* as supported”,

*SystemInformationBlockType22-NB* is not correct since FDD NPRACH Format 2 in non-anchor carrier is included in *SystemInformationBlockType23-NB not SystemInformationBlockType22-NB*. In addition, this case should add condition of *mixedOperationMode.*

If above mentioned issues in **TP2** are addressed, both **TP1** and revised **TP2** can include all the 6 cases not captured in current spec. The main difference between **TP1** and **TP2** is whether to separately put TDD triggering cases.

Moderator proposes to adopt **TP1** to address the NPUSCH postponement issue.

Please provide your views/comments to the proposed TP.

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| **Companies** | **Comments** |
| Ericsson | If the CR is about adding clarity to the specification (if any needed) it seems that describing “one case at a time” as TP2 is better, subject to the amendment related to the SIB23-NB (i.e., SIB23-NB is for NPRACH format2 on non-anchor, not SIB22-NB) and adding the case when the UE capability is not available at the eNodeB. |
| Lenovo, MotoM | Compared with TP1 and revised TP2, we think TP1 is more readable. |
| Qualcomm | Although we are not sure whether this change is critical (given this was already discussed several years ago), we would prefer TP2 (with the SIB22->SIB23 change) in case the group decides to move forward. |
| ZTE, Sanechips | We are fine to describe “one case at a time” But for TP2, besides SIB22-SIB23, the condition of *mixedOperationMode* should be added to the case of NPRACH format 2 in *mixedOperationMode*. |

# Conclusion

To be added

**References**

[1] 3GPP, R1-2105398, Clarification on NPUSCH postponement for NB-IoT, RAN1 #105-e, ZTE

[2] 3GPP, R1-2105940, Discussion on NPUSCH postponement when overlapping with NPRACH, RAN1 #105-e, Huawei, HiSilicon