**3GPP TSG-RAN WG4 Meeting #94-e R4-200xxxx**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 8.1.4, 8.1.4.1-8.1.4.6, 8.1.4.14

**Source:** Ericsson

**Title:** Email discussion summary for RAN4#94e\_#46\_NR\_unlic\_RRM\_Core\_Part\_1

**Document for:** Information

# Introduction

The discussion covers NR-U AIs 8.1.4, 8.1.4.1-8.1.4.6, and 8.1.4.14.

The following open issues were identified, based on the contributions, for the 1st round:

1. **Topic #1: Specification Structure**
* Issue 1-1: do you agree to add “a” in section numbers in 36.133 for NR-U sections?
* Issue 1-2: do you agree that R4-1914628 (agreed in RAN4#93) is enough and CR (38.133) with just NR-U section titles is unnecessary?
1. **Topic #2: General Applicability Rules for NR-U Sections**
* Issue 2-1: do you agree to list the sections applicable for NR-U in the applicability section of the corresponding specification (36.133 and 38.133)?
1. **Topic #3: SIB Reading in Cell Reselection**
* Issue 3-1: do you agree that the Rel-15 approach shall apply and SIB reading shall not be included in cell reselection requirements for NR-U?
1. **Topic #4: SI Reading in RRC Release with Redirection, RRC Re-establishment, and Paging Interruption Requirements**
* Issue 4-1: SI acquisition time
* Issue 4-2: Soft combining assumption
* Issue 4-3: Paging interruption requirements
1. **Topic #5: Cell Reselection (Excluding SI Reading and Paging)**
* Issue 5-1: Mm,max for other DRX cycles (0.64 sec and 1.28 sec)
* Issue 5-2: X dB offset condition for the at least one cell to be checked by the UE
* Issue 5-3: How many times (Y) the UE is allowed to fail the on-going cell reselection due to exceeding any of Md,max, Mm,max, and Me,max?
* Issue 5-4: Ms definition
1. **Topic #6: SIB Reading in HO Requirements**
* Issue 6-1: do you agree that the Rel-15 approach shall apply and SIB reading shall not be included in handover requirements for NR-U?
1. **Topic #7: HO requirements (excluding SIB reading)**
* Issue 7-1: UE behaviour when UL LBT failure recovery is not configured or not supported
* Issue 7-2: UE behaviour when UL LBT failure recovery is configured in HO command
1. **Topic #8: RRC Release with Redirection**
* Issue 8-1: UE behaviour upon exceeding L1,max
* Issue 8-2: UE behaviour upon exceeding L2,max (max. number of missed PRACH occasions)
1. **Topic #9: RRC Re-Establishment**
* Issue 9-1: UE behaviour upon exceeding K1,max and K2,i,max
* Issue 9-2: UE behaviour upon exceeding K3,max
* Issue 9-3: UE behaviour upon exceeding KSI,max
* Issue 9-4: Values for K1,max
* Issue 9-5: Values for K2,i,max
1. **Topic #10: SCell activation**
* Issue 10-1: known SCell definition
* Issue 10-2: THARQ
* Issue 10-3: SCell activation delay, ΔCSI,max
* Issue 10-4: SCell activation delay, condition on HARQ delay
* Issue 10-5: SCell activation delay, max L-values
* Issue 10-6: SCell activation delay, definitions of L parameters
* Issue 10-7: SCell activation delay, X, Y, Z (see the agreement in RAN4#93)
* Issue 10-8: Does the interruption window length at SCell activation depend on DL LBT failures?
1. **Topic #11: PSCell addition**
* Issue 11-1: known PSCell definition
* Issue 11-2: PSCell addition delay, ΔPRACH in TPSCell\_ DU
1. **Topic #12: Active TCI state switching**
* Issue 12-1: known state definition
* Issue 12-2: UE behaviour upon exceeding the agreed maximum L values
* Issue 12-3: UE behaviour related to ΔHARQ

In the above, issues marked in grey will not be further discussed in the 2nd round.

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# Topic #1: Specification Structure

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4 | R4-2000039 | ZTE Corp. | CR (38.133) with spec structure for NR-U |
| R4-2000040 | ZTE Corp. | 1. Without a complete structure for all clauses and sub-clauses, companies might have problems adding sub-sections to 38.133.

If some CRs creating new sub-clauses are about to get approved in this meeting, then the whole structure has to be created to contain the added sub-clauses.Proposal 1: Agree on the CR [4] to create the whole structure of new clauses in 38.133 due to NR-U.A CR to create the entire structure and all the clauses is not needed in 36.133.Proposal 2: In 36.133, newly created NR-U sub-clauses shall end with “.a” to avoid confusion with existing section naming. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1

*Sub-topic description:* ZTE’s proposal “In 36.133, newly created NR-U sub-clauses shall end with “.a” to avoid confusion with existing section naming.”

*Open issues and candidate options before e-meeting:*

**Issue 1-1: do you agree to add “a” in section numbers in 36.133 for NR-U sections?**

* Proposals
	+ Option 1: yes
	+ Option 2: no
* Recommended WF
* Agreements from the 1st round:
	+ Do not add “a” in section numbers in 36.133 for NR-U sections. Follow the section naming outline earlier agreed in R4-1914628 (RAN4#93).

### Sub-topic 1-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-2: do you agree that R4-1914628 (agreed in RAN4#93) is enough and CR (38.133) with just NR-U section titles is unnecessary?**

* Proposals
	+ Option 1: yes
	+ Option 2: no
* Recommended WF
	+ Continue discussion in the 2nd round: Discuss further the two options.

## Proposed agreement: If no agreement can be reached, the CR shall not be pursued.Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Ericsson | Sub topic 1-1: do not agree. Using .A and .a sections will cause confusion. Also the secretary, when discussed with him, did not think it is a good idea, e.g. both “.A” and “.a” will match in a case-insensitive search. Furthermore, in some cases, “A” is already taken, so we would need to go for “B”.Sub topic 1-2: agree, the CR with empty sections is not only unnecessary but also may potentially result in more “void” sections. We can take the big CR approach if the concern is that different subsections get ready at different time points, but, on the other hand, even the latter should not be an issue if all companies prepare all CRs they committed too and follow the numbering agreed in R4-1914628. |
| Qualcomm | Sub topic 1-2: We share the same view as Ericsson. Each requirement (section) has its own editor and there is no need for a “container” CR. |
| ZTE | Sub topic 1-1: “.a” seems to be one of the few options which are not used now.Sub topic 1-2: As a matter of fact, our CR is based on R4-1914628. Note that R4-1914628 is not a CR but an outline. We agree to follow this guideline but a CR is needed in our view to complete the structure of all sub-clauses in 38.133. |
| Huawei | Sub topic 1-1: It may be not a good way to add “.a” to the end of the tile which will make the section for NR-U a sub section of the existing section.  |
| Nokia | Sub topic 1-1: Do not agree. We already have discussed this issue previously and agreed in a format for the NR-U Sections in TS 36.133. Sub topic 1-2: Option 1. The agreements in document R4-1914628 are sufficient, there is no need for a container CR. |
| ZTE | Sub topic 1-1: We don’t have strong view. For companies not preferring “.a”, what can be used? We can agree on any reasonable proposal, just trying to provide our thinking and contribute here.Sub topic 1-2: We don’t agree that a container CR is not needed. OK there’re companies who are in charge of individual clauses, true. One simple question: suppose, under clause “X.1A”, there are two planned clauses for NR-U, X.1A.1 and X.1A.2. What if X.1A.2 is agreed while X.1A.1 is not? This can happen under multiple cases, for example no company brings CR on X.1A.1, or the topic is controversial thus not agreed, etc. Then what would happen if we don’t have this container CR is that under clause X.1A, there’s only a sub-clause X.1A.2. We don’t think this is suitable to appear in specs. |
| Intel | Sub topic 1-1:It is not good readability to use “a” sectionSub topic 1-2:Prefer to the big CR, which can be easier to track and reduce the editor’s effort. |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
| R4-2000039 | ZTE: A CR is needed in our view to complete the structure of all sub-clauses in 38.133. |
| Nokia: We don’t need this CR. We have already agreed on a specification structure and shared the work between companies, which already started bringing the corresponding CRs for discussion. |
| Ericsson: no need in this CR, the specification structure has been agreed already. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary**  |
| **Sub-topic#1-1** | *Tentative agreements:* Do not add “a” in section numbers in 36.133 for NR-U sections. Follow the section naming outline earlier agreed in R4-1914628 (RAN4#93).*Recommendations for 2nd round:* if the above is agreeable, no need to discuss this sub topic in the 2nd round. |
| **Sub-topic#1-2** | *Tentative agreements:* CR R4-2000039 is not needed (does not add anything new to the earlier agreed R4-1914628), to be noted. No need to rediscuss this in the future meetings.*Recommendations for 2nd round:* if the above is agreeable, no need to discuss this sub topic in the 2nd round. |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | - | - |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2000039 | All other companies indicated no need in the CR under sub topic 1-2. So, the proposal is to note the CR and to not bring it again in the next meetings. |

## Discussion on 2nd round (if applicable)

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| **Company** | **Comments** |
| Ericsson | Issue 1-2: Agree with the proposed agreement in the recommended WF. Further, CR R4-2000039 is still not agreeable to us, for the reasons clarified in the 1st round. |
| Qualcomm | Issue 1-2: proposed agreement is fine with us. ZTE’s example on X.1A and the two subsections above actually does not create an issue as far as we can see. First, the editorial assignments and work loads are split at the top level; and if the X.1A.1 is agreed but not X.1A.2, then X.1A.1 appears in the spec while X.1A.2 does not. What is the problem here? |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: General Applicability Rules for NR-U Sections

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4 | R4-2000040 | ZTE Corp. | **Observation 4**: Option 1) would mean a lot of statements added in different parts of the specifications TS 38.133 and TS 36.133.**Observation 5**: If option 1) is taken and companies forget to add some of the statements, it would mean there’s no requirement at all for NR-U in related operations, thus resulting in a broken spec.Proposal 3: In 38.133 and 36.133, assume by default that since NR-U is a part of NR, unless explicitly stated, all requirements in the current spec apply to NR-U operations. If different requirements are needed, new sub-sections shall be created so that readers will understand that the requirements in the parallel old sections don’t apply to NR-U operations. No statement is added anywhere.  |
| 8.1.4.14 | R4-2001393 | Ericsson | CR (36.133), sections 1-3, applicability rules |
| R4-2001394 | Ericsson | CR (38.133), sections 1-3, applicability rules |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 2-1: do you agree to list the sections applicable for NR-U in the applicability section of the corresponding specification (36.133 and 38.133)?**

* Proposals
	+ Option 1: yes
	+ Option 2: no
		- Option 2a: additionally, assume all sections by default applicable for NR-U
		- Option 2b: additionally, exclude the applicability to NR-U by default, unless explicitly stated and:
			* The meaning of “for NR-U”/”to NR-U” is clearly defined, e.g. NR-U serving cell, NR-U neighbour cell, relevance for different NR-U scenarios A-C etc.
* Recommended WF
	+ Discuss the above proposals.
	+ For opponents of Option 1, please answer the questions:
		- For companies who want to include NR-U “by default” (option 2a) in applicability we would like to request them to provide further detailed proposals of exactly what is considered to be within the scope of this default, and how a requirement covered by this default should be interpreted so that we can better evaluate the proposal.
		- For companies who think option 1 is not needed, how do they propose to capture the conditions on what the overall set of requirements is, and which requirements are expected to be met by a UE in a particular operating scenario? (can also be a non NR-U scenario where NR-U neighbors are configured) and with particular NR-U capabilities? (eg capability to support scenario A, B, C etc…)

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Ericsson | Sub topic 2-1: agree to have applicability section with all sections for NR-U listed in one place. Often NR and NR-U variants of requirements can apply concurrently, for example, inter-frequency measurement objects we may have both NR and NR-U frequencies set up in the measurement objects. This can apply either with an NR or NR-U serving cell. The reselection requirements are another case. So we need to state (somewhere) exactly what the requirements apply to. The parallel sections (both NR and non-NR-U) might apply in some cases too. This approach is also safer when new functionalities and features will be added, since including by "default" (approach proposed by ZTE) is more risky than excluding by "default".Questions to opponents of option 1:* For companies who want to include NR-U “by default” (option 2a) in applicability we would like to request them to provide further detailed proposals of exactly what is considered to be within the scope of this default, and how a requirement covered by this default should be interpreted so that we can better evaluate the proposal.
* For companies who think option 1 is not needed, how do they propose to capture the conditions on what the overall set of requirements is, and which requirements are expected to be met by a UE in a particular operating scenario? (can also be a non NR-U scenario where NR-U neighbors are configured) and with particular NR-U capabilities? (eg capability to support scenario A, B, C etc…)
 |
| ZTE | Sub topic 2-1: First to point out that minor errors exist in CRs R4-2001393 and R4-2001394. The one meant for 36.133 says it’s for 38.133 in the header, while the one for 38.133 indicates itself for 36.133.Having a Table summarizing the applicability rules was something I discussed with Ericsson during last meeting, and I can see that this is a clear and straightforward way. However, I have concerns on the consequence if some chapters are missing from this table (no one can guarantee that we have a perfectly complete Table right now since people forget things and make mistakes, like the mistakes in the header of the two CRs). If something is missing then it would mean that there’s no requirement at all for those NR-U related operations, which is not acceptable.By the way, by having dedicated clauses and sub-caluses for NR-U, it’s safe to say that readers will understand the requirements in the old clause doesn’t apply to NR-U related operations, or else why creating dedicated NR-U clauses? So in some sense, the Table suggested in CRs R4-2001393 and R4-2001394 are not really necessary. I think these two CRs provide us a clear roadmap of our progress, but are not really needed in the specification.**Our view in short:** We support Option 2: No because it’s not needed. In 38.133 and 36.133, assume by default that since NR-U is a part of NR, unless explicitly stated, all requirements in the current spec apply to NR-U operations. If different requirements are needed, new sub-sections shall be created so that readers will understand that the requirements in the parallel old sections don’t apply to NR-U operations. No statement is added anywhere since it’s not really necessary. Having dedicated NR-U clauses is itself a very clear applicability indication. |
| Huawei | Sub topic 2-1: Not to have the applicability section with for NR-U. For NR-U related sections, cases are quite complicated. There are cases for NR-U only or for both NR-U and licensed band. It is more straightforward and clear to state the applicability at related sections when necessary, and it is also the common methods which have been adopted in the submitted CRs from last meeting. If listed the applicability sections in one place, readers may have to look up different tables and combine the statements to decide whether the section is for NR-U. Since the specific statements in each related section are necessary, the general applicability tables may also leads to conflict.  |
| Nokia  | Sub-topic 2-1: This needs to be further discussed. We tend to agree with Option 2, not have the applicability section with the table for NR-U, we prefer to exclude the applicability to NR-U by default, and add whenever necessary. We already agreed on the specification structure, mentioning which parts of the specification apply or do not apply for NR-U. Furthermore, both CRs submitted in this agenda item need to be revised to be consistent with the section naming and numbering. For example, in some sections it is listed SectionX.YA and in others Section X.Y.a. There is also an error in the header of the CR. |
| ZTE | We see now the Options have been updated. We support Option 2a.This is because NR-U is a natural part of NR operations (I think this is agreeable).As to how the readers will know if one section applies to NR-U or not, it’s also simple even without applicability statements. The readers, presumably, will first find if there are dedicated chapters for NR-U. For example, if a reader finds a clause titled “6.1A Handover when CCA is used at least in the target cell”, the reader would know that what’s in “6.1 Handover” doesn’t apply to NR-U operations. Based on this example, if no dedicated clauses for NR-U are created, then the reader would refer to chapter “6.1 Handover” for NR-U related operations since NR-U is a part of NR after all.Option 2a is the option which requires the minimum degree of adding applicability statements (almost none) while still clearly deliver the applicability rule to readers. We prefer this option since it keeps the spec clean and simple. |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
| R4-2001393 | ZTE: Thank Ericsson for preparing this, the Table is very clear and straightforward. However, we don’t think it’s really needed in specifications. Please check my comments above for explanation. Besides, the CR header contains error. |
|  Huawei: The applicability parts are not needed. |
| Nokia: We cannot agree to this CR (our comment in issue 2-1). Furthermore, the header of the CR is wrong, the title mentions 36133, but the change request is to 38.133. |
| R4-2001394 | ZTE: Thank Ericsson for preparing this, the Table is very clear and straightforward. However, we don’t think it’s really needed in specifications. Please check my comments above for explanation. Besides, the CR header contains error. |
|  Huawei: The applicability parts are not needed. |
|  Nokia: We cannot agree to this CR (our comment in issue 2-1).  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

During the discussion, option 2 was further split into 2a and 2b, so further discussion is needed on all three options.

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|  | **Status summary**  |
| **Sub-topic#2-1** | *Tentative agreements:**Candidate options:** + Option 1: yes
	+ Option 2: no
		- Option 2a: additionally, assume all sections by default applicable for NR-U
		- Option 2b: additionally, exclude the applicability to NR-U by default, unless explicitly stated and:
			* The meaning of “for NR-U”/”to NR-U” is clearly defined, e.g. NR-U serving cell, NR-U neighbour cell, relevance for different NR-U scenarios A-C etc.

*Recommendations for 2nd round:* Discuss the three options above (1, 2a, and 2b). For opponents of Option 1, please answer the questions:* For companies who want to include NR-U “by default” (option 2a) in applicability we would like to request them to provide further detailed proposals of exactly what is considered to be within the scope of this default, and how a requirement covered by this default should be interpreted so that we can better evaluate the proposal.
* For companies who think option 1 is not needed, how do they propose to capture the conditions on what the overall set of requirements is, and which requirements are expected to be met by a UE in a particular operating scenario? (can also be a non NR-U scenario where NR-U neighbors are configured) and with particular NR-U capabilities? (eg capability to support scenario A, B, C etc…)
 |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2001393 | Depend on the outcome of the discussion above |
| R4-2001394 | Depend on the outcome of the discussion above |

## Discussion on 2nd round (if applicable)

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| **Company** | **Comments** |
| Ericsson | Disagree with option 2a.Further, we view option 1 as easier and more advantageous over option 2b. Often NR and NR-U variants of requirements can apply concurrently, for example, inter-frequency measurement objects we may have both NR and NR-U frequencies set up in the measurement objects. This can apply either with an NR or NR-U serving cell. The reselection requirements are another case. So we need to state (somewhere) exactly what the requirements apply to. The parallel sections (both NR and non-NR-U) might apply in some cases too. Having everything in one place is also more convenient and safer when new functionalities and features will be added.  |
| Qualcomm | We cannot agree to option 1. If there was not a clear structure split on NR-U, having a separate table in the applicability requirement would have made sense. But given the agreements in previous meetings on how NR-U specifications are going to be captured in detail, the proposed table is not necessary. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: SIB Reading in Cell Reselection

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.1 | R4-2000392 | Intel Corp. | **Observation 1**: In LTE and NR with the licensed carrier deployments, UE needs NOT to read the system information of the target cells in order to obtain their global ID (e.g. PLMN, CGI).**Observation 2**: In LTE and NR with the licensed carrier deployments, it is possible to make UE know the priority of the neighbor cell via either the predefined message according to the deployed bands or by X1 signaling.**Observation 3:** In NR-U UE still needs to read MIB/SIB1 of cells in “whitelist” if PCI collision happened between different operators.**Observation 4:** In Rel15 LTE and NR RRM requirements for cell reselection (e.g . Tdetect,EUTRAN\_Intra ) did NOT include the time to detect the target cell’s SIB. **Observation 5:** The start and ending points for cell reselection procedure in NR-U can be same as these of NR. **Observation 6:** While camping on an unlicensed carrier, a completed cell reselection shall include UE decoding on the target cell’s SIB.**Proposal 1:** The requirement for cell reselection NR-U RRC\_Idle in TS38.133 shall be revisited or clarify the quote to include SIB reading. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 3-1: do you agree that the Rel-15 approach shall apply and SIB reading shall not be included in cell reselection requirements for NR-U?**

* Proposals
	+ Option 1: yes
	+ Option 2: no
* Recommended WF
	+ Discuss the WF from Intel
	+ Proposed agreement: If no agreement, the topic shall not be pursued in the next meetings

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Ericsson | Sub topic 3-1: agree to reuse Rel-15 approach, as discussed a lot during several last meetings |
| Qualcomm | Sub topic 3-1: agree to reuse Rel-15 approach. RAN4 should not spend any more time and effort on discussing this issue. |
| Nokia | Sub topic 3-1: agree to reuse Rel-15 approach. As Qualcomm, we believe that RAN4 should not spend any more time and effort on discussing this issue. |
| Intel | Sub topic 3-1: Technically speaking in Rel-15 the case for cell PCI confusion and collision is quite low than the cases in NR-U. They are not comparable. We presented more comprehensive analysis on the consequence the PCI confusion when cell reselection and HO. And no companies denied this is realistic issue. We will not intend to resolve it from other WGs perspective. That is why we prefer to revisit this issue in RAN4 to exclude the legacy requirements when such situation happened. As our proposal in RAN4#93 which will not impact current Rel15 corresponding requirements, we can harmonize to the following WF:* “**The below side condition shall be applied to clarify the requirements for cell reselection and HO in NR-U agreed in [R4-1910551]**

**- *NO PCI collision for neighbor cells deployed in CCA carriers. Exact wording in specification is TBD.”*** |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
|  | Company A |
| Company B |
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|  | Company A |
| Company B |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

The topic has been discussed for several meetings, no company is supporting the inclusion of SIB reading in cell reselection so far.

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|  | **Status summary**  |
| **Sub-topic#3-1** | *Tentative agreements:* If Option 2 (SIB reading shall be included in cell reselection requirements for NR-U) cannot be agreed in this meeting, RAN4 should not continue the discussion on this topic in future meetings.*Candidate options:* same options as in the 1st round:* + Option 1: yes (Rel-15 applies, do not include SIB reading in cell reselection)
	+ Option 2: no (SIB reading shall be included in cell reselection requirements for NR-U)

*Recommendations for 2nd round:* We can discuss a WF from Intel. If no agreement on the inclusion of SIB reading in cell reselection for NR-UE is reached in RAN4#94-e, RAN4 should not continue the discussion on this topic in future meetings. Intel has to provide the complete wording for the WF, clarifying the conditions and how the requirements are to be updated, without just referring to R4-1910551 (which so far does not look agreeable, anyway). The WF should cover both cell reselection and HO. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | “WF on SIB reading in cell reselection and HO requirements for NR-U” | Intel Corp. |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 3-1: we support the proposed agreement in the recommended WF above and would like to further discuss the WF from Intel to be provided separately. |
| Qualcomm | Sub topic 3-1: we support further discussing the WF from Intel but would like to emphasize that this issue has to be settled one way or another in this meeting and cannot be further discussed in the next meeting. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #4: SI Reading in RRC Release with Redirection, RRC Re-establishment, and Paging Interruption Requirements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.1 | R4-2000925 | MediaTek Inc. | **Observation 1**: To meet 95% of decoding success rate, 8, 5, 3, and 2 PDSCH samples are required under SNR condition of -3dB, -2dB, -1dB and 0 dB, respectively. |
| R4-2001745 | Ericsson | **Proposal**: Paging interruption delay requirements are defined for NR-U UEs in IDLE/INACTIVE state by taking into account the extended time needed to acquire the MIB and SIB1 due to LBT failure based on the simulation study. |
| 8.1.4.3 | R4-2001359 | Ericsson | **Observation 1**: SI acquisition time for RRC Release with Redirection and RRC Re-establishment procedures, TSI-NR, are given by TSI-NR = TMIB + TSIB1, where TMIB is the MIB acquisition time and TSIB1 is the SIB1 acquisition time.**Proposal 1**: Define SI acquisition time for NR-U as TSI\_CCA = TMIB\_CCA + TSIB1\_CCA, where TMIB\_CCA is the MIB acquisition time for NR-U and TSIB1\_CCA is the SIB1 acquisition time for NR-U. **Proposal 2**: Set TMIB\_CCA = TSMTC \* GMIB, where TSMTC is the configured SMTC period and GMIB = NMIB + MMIB\_CCA-failure, where NMIB=5 and M MIB\_CCA-failure is the number of LBT failures by the time BS transmits NMIB PBCH samples.**Proposal 3**: Set TSIB1\_CCA = TSIB1 \* GSIB1, where TSIB1 is the SIB1 transmission repetition period (=20ms for FR1) and GSIB1 = NSIB1 + MSIB1\_CCA-failure, where MSIB1\_CCA-failure is the number of slots UE does not receive SIB1 on the SIB1 transmission occasions by the time UE receives NSIB1 PDSCH samples.**Proposal 4**: Set the number of PDSCH samples for SIB1, NSIB1, to 4.**Proposal 5**: Set the SI acquisition time based on the number of PBCH samples for MIB and the number of PDSCH samples for SIB1. |
|  | R4-2001442 | Nokia, Nokia Shanghai Bell | **Observation 1**: Currently, there is no core requirement for the time for the acquisition of the relevant system information. In Annex A6 in TS 38133, in the test cases, the TSI equals 1280ms. **Observation 2**: For the MIB acquisition time, assuming the number of required PBCH samples is equal to 5, 1280 ms is enough to accommodate up to 5 CCA failures (50% failure), except for the case with TSMTC equal to 160 ms, in which 2 LBT failures can be accommodated within this period.**Observation 3**: The simulation assumptions consider 24 PRBs for PDSCH. In NR-U, for CORESET0 with 30kHz, RAN1 has agreed that the minimum number of PRBs is 48.**Observation 4**: For the SIB acquisition time, the simulation results show that the agreed SIB1 acquisition success rate is obtained assuming soft combining of 4 repetitions. **Observation 5**: Considering the SIB1 TTI equal to 160 ms, and soft combining of 4 Repetitions, the total time for SIB1 acquisition time, already accommodating the delay caused by 50% CCA failure, is equal to 160 ms. **Proposal 1**: RAN4 to keep the SI acquisition time equal to 1280 ms. |
|  | R4-2000049 | ZTE | **Observation 1**: 1280 ms of SI decoding time is already used in test cases for both intra-frequency case and inter-frequency case.Proposal 1: SIB reading time in NR-U to be defined as 1280 ms.**Proposal 2**: Define side conditions of RMSI PDSCH decoding with soft combining. |
| 8.1.4.14 | R4-2001564  | Huawei, HiSilicon | **Proposal**: The baseband SIB1 decoding delay is 13 SIB1 transmissions, provided that the scheduling periodicity is no larger than 80ms. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 4-1

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 4-1: SI Acquisition Time**

* Proposals
	+ Option 1 (MediaTek): To meet 95% of decoding success rate, 8, 5, 3, and 2 PDSCH samples are required under SNR condition of -3dB, -2dB, -1dB and 0 dB, respectively.
	+ Option 2 (Huawei): The baseband SIB1 decoding delay is 13 SIB1 transmissions, provided that the scheduling periodicity is no larger than 80ms.
	+ Option 3 (Ericsson): SI acquisition time is TSI\_CCA = TMIB\_CCA + TSIB1\_CCA, where

TMIB\_CCA = TSMTC \* GMIB is the MIB acquisition time for NR-U, where

TSMTC is the configured SMTC period,

GMIB = NMIB + MMIB\_CCA-failure, NMIB=[5], and MMIB\_CCA-failure is the number of LBT failures by the time BS transmits NMIB PBCH samples,

TSIB1\_CCA = TSIB1 \* GSIB1 is the SIB1 acquisition time for NR-U, where

TSIB1 is the SIB1 transmission repetition period (=20ms for FR1),

NSIB1=[4] is the number of PDSCH samples for SIB1,

GSIB1 = NSIB1 + MSIB1\_CCA-failure, MSIB1\_CCA-failure is the number of slots UE does not receive SIB1 on the SIB1 transmission occasions by the time UE receives NSIB1 PDSCH samples.

* + Option 4 (Nokia, ZTE): 1280 ms
* Agreements from the 1st round:
	+ Agreement: RAN4 to further discuss the maximum SI acquisition time in paging interruption, RRC re-direction and RRC re-establishment in NR-U
* Recommended WF
	+ Discuss further the following options:
		- Option 1: The SI maximum acquisition time needs to be defined for NR-U as a function of LBT failures.
		- Option 2: The SI maximum acquisition time needs to be defined for NR-U as a fixed value (e.g., 1280 ms)
		- Option 3: The SI maximum acquisition time needs to be expressed as a variable, which is not function of LBT failures (i.e. same as in Rel-15).
	+ For option 2 and option 3: Answer the following questions:
		- What is the UE behavior if the SI reading becomes too long due to the frequent LBT failure and/or larger SIB1 transmission repetition period?
		- What delay in the corresponding procedures shall the network expect due to SI reading?
	+ Proposed agreement: no restriction on SI periodicity during the SI reading acquisition in the concerned requirements (RRC release with redirection, RRC re-establishment, paging).

### Sub-topic 4-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 4-2: Soft combining assumption**

* Proposals
	+ Option 1: Assume RMSI PDSCH decoding with soft combining for deriving the SI acquisition time. Define the side conditions accordingly.
* Recommended WF:
	+ Proposed agreement on soft combining of PDSCH for SIB1 reading: Soft combining is beneficial to make the SIB1 acquisition time short.
	+ Further discuss whether soft combing must or must not be supported for SI reading in NR-U:
		- Option 1: Yes, soft combining has to be supported, at least for operation in certain scenarios, e.g., low SINR
		- Option 2: no, soft combining does not have to be supported

### Sub-topic 4-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 4-3: Paging Interruption Requirements**

* Proposals
	+ Option 1: Paging interruption delay requirements are defined for NR-U UEs in IDLE/INACTIVE state by taking into account the extended time needed to acquire the MIB and SIB1 due to LBT failure based on the simulation study.
	+ Option 2: TBA
* Recommended WF:
	+ Proposed agreements:
		- Paging interruption requirements are to be updated based on the agreement on the maximum SI acquisition time

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 4-1: support option 3. Option 4 may be a bit tight if BS does not transmit SBI1 every 20ms. Option 2 is too restrictive, since it assumes soft combing of 2 SIB1 samples, but with LBT it’s not certain that they can be transmitted in the desired time period.In R4-2001442 Nokia assumes TSIB1 is fixed 20ms, however it is up to network implementation, it is also possible to transmit SIB1 less frequent, e.g., every 40 ms, 80 ms etc. In this case, SIB1 acquisition is longer. Moreover, MediaTek and Huawei reports even larger number of SIB1 samples such as 8 samples (R4-2000925) and 13 samples (R4-2001564). Also considering the LBT failure, we expect that TSI exceeds 1280 ms even if SMTC=80ms, in order to get the sufficient number of samples. So, we can say that TSI=1280ms is the minimum value, but on top of that RAN4 need to consider the case with many LBT failures and/or larger SSB/SIB1 transmission period.Precluding longer periodicities (always assuming e.g., only 20 ms) in the attempt to compensate for possible LBT failures is not an efficient way to handle LBT failures, resulting in wasting system resources and big restrictions in the network configuration.Questions to opponents of option 3:* Is the assumption that many periodicities are then precluded in the network?
* If the UE does not extend the time to get the sufficient number of samples, then what is the UE behavior if due to LBT the UE did not get enough samples and thus not able to decode over a pre-defined fixed time (e.g., 1280 ms)?

Sub topic 4-2: support using soft combiningSub topic 4-3: support option 1 |
| Qualcomm | Sub topic 4-1: We support option 4 and do not see the need for option 3. Per the analysis in R4-2001442 and R4-2001359, there is enough margin in existing requirements of 1280ms. Furthermore, in core requirements of R16, TSI,NR is only mentioned as parameter. There is no need to specify its breakdown to MIB and SIB1 decoding time and extend the time period by an L factor. It should remain as it was in R15.Further comments on Ericssons questions: RAN4 should keep TSI,NR-U as a parameter just like in R15 and configure the test setup (SI periodicity) in conformance setting according to a desired LBT failure rate. It does not mean higher periods are precluded and it doesn’t need a UE behavior specification because TSI,NR-U is a parameter and not hardened to a value.Sub topic 4-2: No such specification was necessary in R15 and it should stay such in R16 for NR-U. We do not support option 1. Sub topic 4-3: R15 specification is sufficient and no further change is necessary. We do not support option 1.  |
| ZTE | Sub topic 4-1:I’m not sure if it’s MediaTek’s intention to propose Option 1 since they didn’t include any proposals in their paper. Thanks for the simulations and observation BTW.Support Option 4 since it is consistent with the test cases now.Sub topic 4-2:I guess there’re two open issues, one is whether to assume soft combining when deriving SI acquisition time, another is whether to assume SI when defining side conditions. Prefer to separate these two open issues instead of listing them together in Option 1. |
| Huawei | Sub topic 4-1: According to the agreed simulation assumptions. The SNR condition should be -6 dB. The simulation results from option 1 are derived at SNR range from -3 dB to 0 dB. For the Option 3, from our understanding, the simulation results show the soft combine number within 1 TTI (160 ms). For example, when soft-combining with 2 samples is used, the UE may not be able to decode the SIB1 successfully within 1 TTI, but it can keep trying for multiple TTIs. Our simulation results show that based on soft-combining with 2 samples, it will take 12 samples to reach the 95% successful decoding rate. According to Ericsson’s comments, soft combine with more samples leads to better performance. We present the simulation results based on the 2 samples which is the minimum requirements. Sub topic 4-2: Simulation results show that under -6 dB SNR, the SIB1 cannot be decoded successfully with AWGN. Thus the soft combing shall be assumed when decoding the SIB1. As mention in our comments for Sub topic 4-1, the SIB1 reading time should be derived based on the soft-combining with 2 samples.Sub topic 4-3:It should be considered based on the conclusion of previous topics. |
| Apple | Sub-topic 4-1: Agree with Qualcomm’s comment that SI reading time in current TS38.133 is specified as a parameter and the exact value will only be reflected in the test case. So we may need to decide a value based on certain conditions and that value and conditions would be used in the test design in performance stage.Sub-topic 4-2 and 4-3: we may not need to define the numeric core requirement for this SI acquisition or paging interruption time. We could reuse the same approach in current spec, because the current spec also use a parameter instead of an numeric value for TSI-NR . We only need to use the simulation results to design the test case, i.e., to decide what the condition and delay is in test setup/requirement. |
| Nokia | Sub topic 4-1: Option 4. As shown in our contribution R4-2001442, 1280ms is more than enough to accommodate SIB and MIB decoding as well as LBT failures during the procedure. There is no reason to define Tsi for NR-U if it is not specified in NR Rel-15.Sub-topic 4-2: NR-U is based on NR release 15. In NR Rel-15, there is no such assumption. Why should it be done in NR-U? Furthermore, we believe that this issue is related to the sub-topic 4-1. We do not agree with option 1.Sub-topic 4-3: This issue depends on agreements in sub-topic 4-1. If it is agreed to extend the time for SI decoding, we can discuss the paging interruption requirements. |
| MTK | Sub-topic 4-1: Same principle in R15 can be re-used, i.e. the SI reading time is specified as a parameter and the exact value will only be reflected in the test case. The exact value can be discussed in the performance part. Besides, our Tdoc is to provide simulation result for reference.Sub-topic 4-2: We do not support option 1. Same assumption in R15 can be re-used. CGI reading have the related discussion, and we could wait for the conclusion. Sub-topic 4-3: We do not support option 1. Similar as 4-1, the SI reading time is not necessary to be captured in the core part.  |
| Intel | Sub topic 4-2Same assumption in R15 can be re-used. Soft combine is up to UE implementation. No need to be mandatory as define the requirements.  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
|  | Company A |
| Company B |
|  |
|  | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#4-1** | Several companies provided results, indicating the need for soft combining.Some companies see the need in the updating requirements for NR-U, some companies think that the SI acquisition time can be left as a variable in the requirements. However, even with the latter, the SI acquisition time should not be infinite. What if the SI reading becomes too long? The network needs also to know how long it is allowed to be, for all periodicities. The issue needs further discussion.*Tentative agreements:* RAN4 to further discuss the maximum SI acquisition time in paging interruption, RRC re-direction and RRC re-establishment in NR-U. The related requirements shall not imply any restriction on SI periodicity.*Candidate options:** + - 1. The SI maximum acquisition time needs to be defined for NR-U as a function of LBT failures
			2. The SI maximum acquisition time needs to be defined for NR-U as a fixed value
			3. The SI maximum acquisition time needs to be expressed as a variable, which is not function of LBT failures (i.e. same as in Rel-15).

Answer the following questions:* What is the UE behavior if the SI reading becomes too long?
* What delay in the corresponding procedures shall the network expect due to SI reading?

*Recommendations for 2nd round:* Discussion the above options (1, 2 and 3). Answer the questions. |
| **Sub-topic#4-2** | *Tentative agreements:* Soft combining is beneficial.*Candidate options:*Soft combining has to be supportedSoft combining does not need to be supported*Recommendations for 2nd round:* |
| **Sub-topic#4-3** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* no consensus, further discussion is needed |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 4-1: support proposed agreement in the recommended WF (no restriction in the requirements, all configurable periodicities shall also be supported in the requirements). Support option 1 in the recommended WF.Sub topic 4-2: support the proposed agreement in the recommended WF. Support option 1.Sub topic 4-3: support proposed agreements in the recommended WF |
| Qualcomm | Sub topic 4-1: We support option 3 (same as R15). In response to the questions that are posed, we reply with similar questions: what was the UE behavior in R15 if SIB reading became too long and why should it be any different in NR-U? Looking at Section A.6.3, all tests that use 1280 ms for TSI,NR have a periodicity of 20ms for SSB (i.e., RMSI periodicity). So in R15, what does NW assume for TSI,NR when the RMSI periodicity is not 20ms? And why should it be any different in NR-U?Sub topic 4-2: what does the tentative agreement “soft combining is beneficial” mean? Of course soft combining is beneficial under some conditions and not necessary under other conditions. How does the “soft combining is beneficial” going to be captured in TS 38.133? It is UE’s choice whether it performs soft combining or not. What matters is that UE should meet the requirements. Similar to sub topic 4-1, we feel this topic is not specific to NR-U and is also relevant in R15 NR. Since R15 NR did not specify anything particular about it, NR-U should not either. We neither support option 1 nor option 2. There should be a third option: “as in R15” which is what we can agree on.Sub topic 4-3: subject to agreements in sub topic 4-1 and 4-2. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #5: Cell Reselection (Excluding SI Reading and Paging)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.1 | R4-2000714 | Qualcomm Inc. | **Observation 1**. In the initial acquisition stage, UE cannot reliably decide on the presence or absence of an SSB based on a single sample (SMTC occasion). Moreover, in initial acquisition stage, UE is not even aware of the value of *Q* factor as it may not have yet decoded PBCH.**Proposal 1**. Ms is the number of DRX cycles with at least one SMTC where SSBs are unavailable at the UE during Nserv. **Table 4.2A.2.2-1: Nserv**

|  |  |
| --- | --- |
| **DRX cycle length [s]** | **Nserv [number of DRX cycles]** |
| 0.32 | M1\*4+M1\*Ms |
| 0.64 | M1\*4+M1\*Ms |
| 1.28 | 2+Ms |
| 2.56 | 2+Ms |
| Note 1: The requirements apply, provided that Ms<= Ms,max, where Ms,max=[8] for DRX cycle length < 1.28 s, [4] for DRX cycle length ≥ 1.28 s.Note 2: The UE shall restart the measurements used for serving cell evaluation if Ms exceeds Ms,max.Note 3: At least one SSB index in the same SSB position index shall satisfy the side conditions in clause B.1.2 during Nserv.  |

**Proposal 2.** All side condition tables in Appendix B.1 of TS 38.133 to be updated to reflect spectrum for unlicensed access. This update can follow the conclusion of discussions in RF room on REFSENS for NR-U.**Observation 2**. In the detection stage, UE cannot reliably decide on the presence or absence of an SSB based on a single sample (SMTC occasion). If it could, then R15 requirements would have used one sample for the identification stage.**Observation 3**. Mandating a UE that operates in unlicensed spectrum to always monitor all candidate SSB positions during measurement and evaluation phases results in increased power consumption compared to a R15 UE. In addition, in many deployments such as Industrial IoT or FBE, the rate of CCA failure is quite low. **Proposal 3**. Clarification NOTEs to be added to Tables 4.2A.2.3-1 as in the following:**Table 4.2A.2.3-1: Tdetect,NR\_Intra, Tmeasure,NR\_Intra and Tevaluate,NR\_Intra**

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Tdetect,NR\_Intra [s] (number of DRX cycles)** | **Tmeasure,NR\_Intra [s] (number of DRX cycles)** | **Tevaluate,NR\_Intra****[s] (number of DRX cycles)** |
| 0.32 | 0.32x([36]+Md)xM2 {([36]+Md)xM2} | 0.32x([4]+Mm) xM2{([4]+Mm)xM2} | 0.32x([16]+Me) x M2{([16]+Me)xM2} |
| 0.64 | 0.64x([28]+Md) {[28]+Md} | 0.64x([2]+Mm) {[2]+Mm} | 0.64x([8]+Me) {[8]+Me} |
| 1.28 | 1.28x([25]+Md){[25]+Md} | 1.28x([1]+Mm){[1]+Mm} | 1.28x([5]+Me) {[5]+Me} |
| 2.56 | 2.56x([23]+Md){[23]+Md} | 2.56x([1]+Mm){[1]+Mm} | 2.56x([3]+Me) {[3]+Me} |
| Note 1: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1.Note 2: Md, Mm, Me are the number of SMTC occasions not available at the UE during the corresponding time periods.Note 3: Mm,max, Md,max and Me,max is the maximum value of Mm, Md and Me. Mm,max: TBD for 0.32 s DRX cycle length; [8] for 0.64 s DRX cycle length; [4] for 1.28 s DRX cycle length; TBD for 2.56 s DRX cycle length, and Md,max=[4]\*Mm,max, Me,max=[2]\*Mm,max.Note 4: UE shall restart the measurements if the limits are exceeded.Note 5: At least one SSB index in the same SSB position index shall satisfy the side conditions in clause B.1.2 during Tdetect\_NR\_intra.Note 6: UE considers a SMTC occasion unavailable if the SSB index of the identified cell at the detected SSB position index is not available. |

Same notes to be added to Table 4.2A.2.4-1.**Proposal 4.** After *N* unsuccessful measurement attempts due to exceeding the max number of unavailable SMTC occasions, UE should restart from the detection stage again. Value of *N* can be further discussed in RAN4. **Observation 4.** No further specification is required in RAN4 to reflect the RAN2 agreement regarding lowering the priority of a frequency with unsuitable PLMN. |
| R4-2000924 | MediaTek Inc. | **Observation 1:** There will be a case that UE can only find the cells outside the predefined X dB but also fulfill the resection margins.Proposal 1: Not necessary to specify XdB for cells to be checked by the UE for cell-reselection. |
| R4-2001438 | Nokia, Nokia Shanghai Bell | **Observation 1**: The unsuitable highest ranked cell is not considered for cell reselection for 300 seconds. Therefore, it will not affect the cell reselection procedure to other cells in the same frequency. Proposal 1: RAN4 not to define an additional power limit between the strongest cell on a frequency, which is considered unsuitable for cell reselection, and the other cells checked by the UE for cell re-selection.**Observation 2**: In previous RAN4 meetings, RAN 4 has discussed and agreed on sufficient mechanisms to handle LBT failures during cell re-selection. **Observation 3**: RAN1 has also defined mechanisms to increase the probability of sending SSBs when there is an LBT failure during the DRS transmission window.**Observation 4**: No new UE behaviour is needed to deal with the case in which the re-selection to the highest ranked cell fails due to LBT. |
| R4-2001554 | Huawei, HiSilicon | **Observation 1:** RAN2 has specified corresponding UE behaviors for the case when the best cell is not suitable for reselection.**Proposal 1:** There is no need to introduce the additional restriction that the cell for reselection should not be X dB weaker than the strongest cell on that frequency.  |
| R4-2001741 | Ericsson | **Proposal**: The UE shall attempt cell re-selection on at least one more cell (which fulfils the re-selection margin) after it has failed an on-going cell re-selection attempt due to exceeding any of Md,max, Mm,max and Me,max Y times, where Y=4. |
| R4-2001742 | Ericsson | CR (38.133) with RRC\_IDLE UE requirements for NR-U |
| R4-2001744 | Ericsson | **Proposal**: The definition of Ms, as agreed at previous meeting, shall always apply for UEs performing serving cell evaluation in IDLE/INACTIVE states. |
| R4-2001914 | Ericsson | CR (36.133) with inter-RAT RRC\_IDLE requirements for NR-U |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 5-1

*Sub-topic description:*

Agreements from RAN4#93:

[16] for 0.32 sec DRX cycle,

[4] for 2.56 sec DRX cycle.

*Open issues and candidate options before e-meeting:*

**Issue 5-1: Mm,max for other DRX cycles (0.64 sec and 1.28 sec)**

* Proposals
	+ Option 1: Mm,max = [8] for DRX cycle = 0.64 seconds,

 Mm,max = [4] for DRX cycle = 1.28 seconds

* + Option 2: TBA
* Agreements from the 1st round:
	+ Agreement:
	+ Mm,max = [8] for DRX cycle = 0.64 seconds,
	+ Mm,max = [4] for DRX cycle = 1.28 seconds
* Recommended WF

### Sub-topic 5-2

*Sub-topic description:*

From RAN4#93: FFS: At least one cell which is checked by the UE for cell re-selection on each frequency is such that it is not more than X dB weaker than the strongest cell on that frequency, and it also fulfills the reselection margins, where value of X is TBD

*Open issues and candidate options before e-meeting:*

**Issue 5-2: X dB offset condition for the at least one cell to be checked by the UE**

* Proposals
	+ Option 1: do not specify
	+ Option 2: specify
* Agreements from the 1st round:
	+ Agreement: Do not specify the X dB offset condition for the at least one cell to be checked by the UE
* Recommended WF

### Sub-topic 5-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 5-3: How many maximum times (Y) the UE is allowed to fail the on-going cell reselection due to exceeding any of Md,max, Mm,max, and Me,max, before it initiates cell selection procedures for the selected PLMN as defined in TS 38.304 [1]?**

* Proposals
	+ Option 1: Y>1 (e.g.,[4]), specified.
	+ Option 2: Y=1
	+ Option 3: Y=infinity
	+ Option 4: Y=0 (no reattempt is allowed)
	+ Option 5: unspecified (will the UE get stuck in the loop in this case?)
* Recommended WF
	+ Discuss the updated proposals

### Sub-topic 5-4

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 5-4: Ms definition**

* Proposals
	+ Option 1: the agreed (in previous meetings) Ms definition shall always apply for cell reselection
	+ Option 2: needs to take into account QCL factor
* Recommended WF
	+ Discuss the two options above

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 5-1: support option 1Sub topic 5-2: Ok to not define X dB, but still need to limit the number of reselection attempts for the cell being reselected before trying the “at least one more cell”.Sub topic 5-3: support option 1, namely:Upon exceeding the restart of the evaluation/detection or measurement Y times, the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [1].Such UE behavior is aligned with the already existing text in Rel-15 38.133: “If the UE in RRC\_IDLE has not found any new suitable cell based on searches and measurements using the intra-frequency, inter-frequency and inter-RAT information indicated in the system information for 10 s, the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [1].”Sub topic 5-4: support option 1 |
| Qualcomm | Sub topic 5-1: We support option 1.Sub topic 5-2: We support option 1. Moreover, we don’t believe it is necessary to limit the number of reselection attempts. In TS 38.133, we have “The UE shall search every layer of higher priority at least every Thigher\_priority\_search = (60 \* Nlayers) seconds, where Nlayers is the total number of higher priority NR and E-UTRA carrier frequencies broadcasted in system information” which prevents the UE from being stuck in an endless loop. Sub topic 5-3: Specification of Y and its value is unnecessary. Moderator, please add another option “Specification of Y is unnecessary” to the list. Also, Ericsson’s quote of TS 38.133 is the perfect response for not needing any further complication of spec via introducing a Y parameter.Sub topic 5-4: Option 1 is vague and lacks the clarifications that we brought up in our proposal. |
| ZTE | Sub topic 5-2:Support Option 1. We agree with the view in R4-2001438 that there’s already a 300-second requirement which should be enough to prevent ping-pong effect.Moderator: Option 2 is mentioned, but the clarification seems to favor Option 1?Response to Moderator: Yes we meant Option 1, thanks! |
| Huawei | Sub topic 5-2: There is no need to specify additional X dB offset condition since RAN2 has define the corresponding behavior when the strongest cell is not suitable for re-selection.Sub topic 5-3: We share the same views as Qualcomm. UE won’t get stuck in a single layer. |
| Nokia | Sub-topic 5-1 Option 1.Sub-topic 5-2 Option 1: do not specify. There is no need for such offset. RAN2 has already defined all the necessary mechanisms for cell re-selection in NR-U.Sub-topic 5-3 It seems unnecessary to specify this value. Sub-topic 5-4 Option 1: the agreed Ms definition shall always apply for cell reselection, we should not include the QCL assumption on it. |
| MTK | Sub topic 5-2: We support option 1. Sub topic 5-3: We disagree with option 1. Y is unnecessary to be specified.Sub topic 5-4: Clarification for candidate SSB position index would be need. |
| Intel | Sub topic 5-1: option 1 can be agreed in the recommended WF.Sub topic 5-3: “Y” can be used to avoid too long waiting time for cell reselection. But what is the exact UE behavior when Y exceeds the limitation? |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001742 |  Huawei: It is better to handle the CRs in the second round since we still have a lot remaining issues about this topic. It is suggested to capture all agreements in the section editor’s CR according to the work split to introduce the NR-U related section at beginning. |
| Nokia: It is not possible to agree with this CR yet. There are many open issues. This document contains items that were not yet agreed, such as the inclusion of a new reselection margin There is also the issue of the number of times the UE shall reinitiate the measurements, which was not even discussed in RAN4. |
|  |
| R4-2001914 |  Huawei: It is better to handle the CRs in the second round since we still have a lot remaining issues about this topic. It is suggested to capture all agreements in the section editor’s CR according to the work split to introduce the NR-U related section at beginning. |
| Nokia: The clause number is different from what was agreed in document R4-1914628. Additionally, to follow what was agreed for other parts of the specification, the clause number should be 4.2.2.5.6A. This document contains items that were not yet agreed, such as the inclusion of a new reselection margin. It is not possible to agree with this CR. |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#5-1** | *Tentative agreements:*Mm,max = [8] for DRX cycle = 0.64 seconds,Mm,max = [4] for DRX cycle = 1.28 seconds*Recommendations for 2nd round:*If the above is agreeable, no need for the 2nd round on this sub topic |
| **Sub-topic#5-2** | *Tentative agreements:*Do not specify the X dB offset condition for the at least one cell to be checked by the UE*Recommendations for 2nd round:* If the above is agreeable, no need for the 2nd round on this sub topic. |
| **Sub-topic#5-3** | *Tentative agreements:**Candidate options:* How many **maximum** times (Y) the UE is allowed to fail the on-going cell reselection due to exceeding any of Md,max, Mm,max, and Me,max, before it initiates cell selection procedures for the selected PLMN as defined in TS 38.304 [1]?* + Option 1: Y>1 (e.g., [4]).
	+ Option 2: Y=1
	+ Option 3: Y=infinity
	+ Option 4: Y=0 (no reattempt is allowed)
	+ Option 5: unspecified (will the UE get stuck in the loop in this case?)

*Recommendations for 2nd round:* no consensus, further discuss the options above |
| **Sub-topic#5-4** | *Tentative agreements:**Candidate options:* *Recommendations for 2nd round:* no consensus, further discussion is needed |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2001742 | Need to collect technical comments. In the next meeting, the company who committed to submit CR for this topic (unfortunately did not submit any CR in this meeting) should take into account these comments in their CR. |
| R4-2001914 | Need to collect technical comments. In the next meeting, the company who committed to submit CR for this topic (unfortunately did not submit any CR in this meeting) should take into account these comments in their CR. |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 5-3: support option 1. Upon exceeding the restart of the evaluation/detection or measurement Y times, the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304 [1].Sub topic 5-4: support option 1 |
| Qualcomm | Sub topic 5-3: support option 5. Specification of Y is unnecessary as UE behavior is adequately specified in TS 38.304 and TS 38.133Sub topic 5-4: We disagree with option 2. Our proposals in R4-2000714 is not even captured by the moderator in the summary. So we will bring them forward in the next meeting.  |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #6: SIB Reading in HO Requirements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.2 | R4-2000393 | Intel Corp. | **Observation 1:** In LTE and NR with the licensed carrier deployments, UE needs NOT to read the system information of the measured neighbor cells to acquire their PLMN.**Observation 2:** In NR-U,if UE reports the measurement results of all cells in unlicensed frequencies (both intra and inter frequency) without any PLMN, the serving cell may not make a correct HO decision.**Proposal 1:** In NR-U, UE shall obtain the addition system information of the neighbor cells to avoid the ambiguity of the correct target cells during the HO decision and request.**Observation 3a**: UE can report neighbor cell’s PLMN information known by UE to the serving cell. **Observation 3b**: UE can also check the target cell’s accessibility autonomously and report the qualified target cells to the serving gNB only.**Observation 4**: in RAN4, the start and end pint to define HO delay is the HO request from the serving cell and UE initiating random access respectively.**Observation 5:** The time to be extended is the neighbor cell detection including the system information acquisition can be out of the duration to specify the handover interruption delay in RAN4. **Proposal 2**: There are little impacts on NR-U HO requirement due to PLMN and other SIB reading but some clarifications on the side conditions.**Observation 6**: In NR-U blind HO if the serving cell forward HO command without the PLMN or other CGI, UE needs to search and measure more cells beside the target cell indicated in HO command. And it is highly possible UE handover to the wrong target cell which has a same PCID with the target cell but not PLMN.**Observation 7**: In NR-U blind HO in order to avoid the wrong handover, the additional information of the serving cell forward HO command (e.g. the PLMN or other CGI,) is needed. At a same time, UE needs to check the search cell’s PLMN via the SIB reading.**Observation 8**: in RAN4, the requirements for blind HO in NR-U shall count the time for the SIB reading.**Proposal 3**: For blind HO, Tsearch shall include SIB reading. |
| R4-2001440 | Nokia, Nokia Shanghai Bell | **Observation 1**: PCI collisions may also happen in licensed spectrum. **Observation 2**: ANR function enables the network to identify PCI collisions.**Observation 3**: RAN4 Rel-15 does not define specific extra time for reading the SIB due to possible PCI collisions.**Observation 4**: RAN2 has introduced a whitelist mechanism to address the PCI collisions occurring in unlicensed spectrum. **Observation 5**: RAN2 has agreed that no additional mechanisms are introduced to address PCI collisions in NR-U Rel-16.**Observation 6**: There is no need for RAN4 to include an additional time for SI reading during handover.**Proposal 1**: RAN4 to adopt the same approach for unlicensed spectrum, as in licensed spectrum, and do not define different requirements for handover cases with PCI collisions. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 6-1

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 6-1: do you agree that the Rel-15 approach shall apply and SIB reading shall not be included in handover requirements for NR-U?**

* Proposals
	+ Option 1: yes
	+ Option 2: no
* Recommended WF
	+ Discuss the WF from Intel
	+ Proposed agreement: If no agreement, the topic shall not be pursued in the next meetings

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 6-1: support Rel-15 approach (option 1) |
| Qualcomm | Sub topic 6-1: We support option 1. RAN4 should not spend any more time in discussing this topic that has been discussed in several meetings so far.  |
| ZTE | Sub topic 6-1:Support Option 1. No need for further specification. |
| Nokia | Sub topic 6-1: Option 1. Nothing new is needed in NR-U. It is also important to highlight that this issue has been discussed since RAN4 92, and RAN4 should not spend more time with this. |
| Intel  | Same comments for topic #3 |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

The topic has been discussed for several meetings, no company is supporting the inclusion of SIB reading in HO requirements.

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#6-1** | *Tentative agreements:* If Option 2 (SIB reading shall be included in HO requirements for NR-U) cannot be agreed in this meeting, RAN4 should not continue the discussion on this topic in future meetings.*Candidate options:* same as above:* + Option 1: yes (Rel-15 applies, do not include SIB reading in HO)
	+ Option 2: no (SIB reading shall be included in HO for NR-U)

*Recommendations for 2nd round:* We can discuss a WF from Intel. If no agreement on the inclusion of SIB reading in HO requirements for NR-UE is reached in RAN4#94-e, RAN4 should not continue the discussion on this topic in future meetings. Intel has to provide the complete wording for the WF, clarifying the conditions and how the requirements are to be updated, without just referring to R4-1910551 (which so far does not look agreeable, anyway). The WF should cover both cell reselection and HO – see sub topic 3-1. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | To be discussed together with SIB reading for cell reselection, see a suggested WF for sub topic 3-1. |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 6-1: we support the proposed agreement in the recommended WF above and would like to further discuss the WF from Intel to be provided separately. |
| Qualcomm | Same comment as in sub topic 3-1. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #7: HO Requirements (Excluding SIB Reading)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.2 | R4-2001555 | Huawei, HiSilicon | **Observation 1**: There is already a timer T304 to limit the maximum duration of the Handover process which is sufficient avoid an overlong HO process due to LBT.**Observation 2**: The consistent UL LBT recovery won’t apply in the PRACH transmission during the HO process.**Observation 3**: UE will keep attempting PRACH transmission until T304 expires. **Proposal 1**: From RAN4’s perspective, the UE behavior when UE cannot transmit in UL is defined by T304 in the Handover process. |
| R4-2002132 | Qualcomm Inc. | **Observation 1**: RAN2 specs show that network can configure lbt-FailureInstanceMaxCount, the maximum number of LBT failures that UE should experience before starting LBT failure recovery mechanisms.**Observation 2**: UE is supposed to return to idle mode after the expiration of T304 timer.**Observation 3**: RAN2 is currently discussing to make ‘LBT recovery mechanism’ a UE capability feature.**Proposal 1**: * The UEs that support UL LBT failure recovery feature, take one of the following two steps:
	+ perform LBT failure recovery procedure (as shown in 38.321) if they experience lbt-FailureInstanceMaxCount backoffs due to LBT before the expiration of T304 timer or
	+ return to idle mode after the expiration of T304 timer if they don't experience lbt-FailureInstanceMaxCount backoffs due to LBT before the expiration of T304 timer.

The UEs that don’t support UL LBT failure recovery feature try to transmit PRACH up to preambleTransMax attempts and return to idle mode after the expiration of T304 timer. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Agreement from RAN4#93:

Clarify UE behaviour (refer to RAN2 spec and T304 timer) when UE cannot transmit in UL.

### Sub-topic 7-1

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 7-1: UE behaviour when UL LBT failure recovery is not configured or not supported**

* Proposals
	+ Option 1: transmit PRACH up to X attempts, abandon handover procedure after expiration of T304
	+ Option 2: TBA
* Recommended WF
	+ Proposed agreement: transmit PRACH up to X attempts, abandon handover procedure after expiration of T304

### Sub-topic 7-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 7-2: UE behaviour when UL LBT failure recovery is configured in HO command**

* Proposals
	+ Option 1: perform UL LBT failure recovery, unless T304 expires (provided the UL LBT failure recovery can be configured in HO command – check with RAN2)
	+ Option 2: TBA
* Recommended WF
	+ Proposed agreement:
		- Agree on the draft LS in R4-2002282 (LS to RAN2 on UL LBT failure recovery for the target cell)

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 7-1: support Option 1Sub topic 7-2: UL LBT failure recovery for PRACH in the target cell is not possible at HO, according to RAN2 procedure. According to RAN2, the UL LBT failure recovery for PRACH applies only for the serving cell, and it does not extend to the target cell automatically. |
| Qualcomm | Sub topic 7-1: support option 1. Moreover, the value of X follows RAN2 specification (RRC parameter) and does not need to be specified by RAN4.Sub topic 7-2: our understanding is that RRC parameters related to persistent UL LBT failure is provided in the RRC reconfiguration message as part of HO command and therefore, this mechanism is also applicable to PRACH in the target cell. We do not share the same view as Ericsson on UL LBT failure recovery not being applicable to target cell and also consulted with our RAN2 colleague. An LS to RAN2 to get clarification on this issue may be helpful if agreeable by other companies.  |
| ZTE | Sub topic 7-1:Option 1 seems fair. Don’t think there’s much RAN4 needs to specify since UE behavior is pretty much specified by T304.Sub topic 7-2:Option 1 seems fair. |
| Nokia | Sub-topic 7-1: the text in option 1 is not clear, so we cannot agree to that. RAN2 (RAN2#105bis) has already determined that the PRACH retransmission counter will not be updated due to UL LBT failure. RAN2 has procedures in place for the case where the counter reaches preambleTransMax (TS 38.321), so RAN4 should not define a value of X. UE behaviour upon T304 expiry is also defined in RAN2 specification, RAN4 should just refer to 38.331. This discussion is in the scope of RAN2. Sub-topic 7-2: also scope of RAN2. If configured, the UL LBT failure recovery process should be running, as well as RRC. It is up to network implementation to ensure proper configurations of both. |
| MTK | Sub topic 7-1: Option 1 can be agreed with the clarification that X is not necessary to be specified in RAN4. Sub topic 7-2: It should be consistent with RAN2 specification, and other applicable cases can be FFS.  |
| Intel  | Sub topic 7-1: in our view, if the proper T304 can avoid the too long waiting time due to UL LBT failure, such requirements (e.g. X) is unnecessary. |

###  CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#7-1** | *Tentative agreements:*transmit PRACH up to X attempts, abandon handover procedure after expiration of T304*Recommendations for 2nd round:* if the above is agreeable, no 2nd round is needed for this topic, otherwise further discss |
| **Sub-topic#7-2** | *Tentative agreements:*Send LS to RAN2 to ask about the current support of UL LBT failure recovery for the target cell*Candidate options:**Recommendations for 2nd round:* discuss the draft LS |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | LS to RAN2 on UL LBT failure recovery for the target cell | Ericsson |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 7-1: support proposed agreement in the recommended WFSub topic 7-2: support proposed agreement in the recommended WF |
| Qualcomm | Sub topic 7-1: all companies (except one) that commented in 1st round mention that the phrasing of the recommended WF is incorrect, there is no need to bring up parameter X, and no new UE behavior is needed. The recommended WF ignores the majority’s view.Sub topic 7-2: We support sending an LS to RAN2 to clarify the issue. Comments on the specific wording of LS will be provided in the separate email thread. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #8: RRC Release with Redirection

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.3 | R4-2000047 | ZTE | **Observation 1**: UE behavior when not able to identify a suitable cell indicated by *redirectedCarrierInfo* in the *RRCRelease* message is already defined in TS 38.304. The UE is allowed to camp on any NR cell.Proposal 1: When L1 exceeds L1,max, the UE is allowed to camp on any NR cell. After the UE selects which cell to camp on, the UE shall start to send random access to the target NR cell within TSI-NR + (1+L2)\*TRACH.Proposal 2: When L1 exceeds L1,max, the UE shall select a cell to camp on within a limited time duration. For the requirement, take cell reselection requirement as baseline.**Observation 2**: Existing RAN2 mechanism on UL LBT failure doesn’t apply to UEs in IDLE or INACTIVE mode.**Proposal 3**: When L2 exceeds L2,max, the UE shall camp on any NR cell. The requirement shall be similar to the case when L1 exceeds L1,max. |
| R4-2001556 | Huawei, HiSilicon | **Proposal 3**: When the unavailable DMTC cycles during the cell search process exceeds the maximum values, the UE is allowed to camp on any suitable cell of the indicated RAT. |
|  | R4-2001847 | Ericsson | **Observation 1**: The cell search delay (Tidentify-NR) in RRC connection release procedure also includes L1 filtered SS-RSRP measurement. **Proposal 1**: When L1 exceeds L1,max, the UE shall restart the identification of the target cell on the carrier configured for RRC connection release with redirection. **Proposal 2**: Due to L1 exceeding L1,max, the UE is required to restart the identification of the target cell on the carrier configured for RRC connection release with redirection at least *N* times; where *N* =3. Upon exceeding *N* the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304.**Observation 2**: According to the RAN2 procedure the UE upon reaching consistent uplink LBT failures on PRACH in PCell shall declare RLF.**Proposal 3**: The parameter, maximum allowed number of missed PRACH occasions (L2, max), shall not be specified by RAN4.  |
|  | R4-2002133 | Qualcomm Inc. | **Observation 1**: RAN2 specs show that network can configure lbt-FailureInstanceMaxCount, the maximum number of LBT failures that UE should experience before starting LBT failure recovery mechanisms.**Observation 2**: RAN2 is currently discussing to make ‘LBT failure recovery mechanism’ a UE capability feature. **Proposal 1**: Value of L2,max and K3,max do not need to be defined for RRC release with redirection request and RRC re-establishment delay.* During these procedures, the UEs that support UL LBT failure recovery feature, take one of the following two steps:
	+ - perform LBT failure recovery procedure (as shown in 38.321) if they experience lbt-FailureInstanceMaxCount backoffs due to LBT before the expiration of T311 timer or
		- return to idle mode after the expiration of T311 timer if they don't experience  lbt-FailureInstanceMaxCount backoffs due to LBT before the expiration of T311 timer.
* The UEs that don’t support UL LBT failure recovery feature try to transmit PRACH up to preambleTransMax attempts and return to idle mode after the expiration of T311 timer.

**Proposal 2**: RAN4 agrees to include the following text within the ‘random access’ section of 38.133:“If UE cannot transmit random access preamble due to LBT failure, it will perform the random access resource selection procedure defined in clause 5.1.2 in TS 38.321.” |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Agreement from RAN4#93:

* FFS UE behavior upon exceeding L1,max
* FFS UE behavior upon exceeding L2,max

### Sub-topic 8-1

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 8-1:** **UE behaviour upon exceeding L1,max**

* Proposals
	+ Option 1 (Ericsson): UE shall restart the identification of the target cell on the carrier configured for RRC connection release with redirection. UE can restart at least *N* times (e.g., *N* =3). Upon exceeding *N* the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304.
	+ Option 2 (Huawei): When the unavailable DMTC cycles during the cell search process exceeds the maximum values, the UE is allowed to camp on any suitable cell of the indicated RAT.
	+ Option 3 (ZTE): Camp on any suitable cell of the indicated RAT within a limited time, after which the UE shall start to send random access to the target NR cell within TSI-NR + (1+L2)\*TRACH.
* Recommended WF
	+ Discuss further the following two options:
		- Option 1: UE shall restart the identification of the target cell on the carrier configured for RRC connection release with redirection. UE can restart at least *N* times (e.g., *N* =3). Upon exceeding *N* the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304.
		- Option 2: When the unavailable DMTC cycles during the cell search process exceeds the maximum values, the UE is allowed to camp on any suitable cell of the indicated RAT within a limited time, after which the UE shall start to send random access to the target NR cell within TSI-NR + (1+L2)\*TRACH.

### Sub-topic 8-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 8-2: UE behaviour upon exceeding L2,max (max. number of missed PRACH occasions)**

* Proposals
	+ Option 1 (Ericsson, Qualcomm): do not specify L2,max, refer to 38.321.
	+ Option 2 (Huawei): Camp on any suitable cell on the configured for redirection carrier, and if not possible camp on any suitable cell of the indicated RAT.
	+ Option 3 (ZTE): Camp on any suitable cell of the indicated RAT, similar to the behaviour for L1,max
* Recommended WF
	+ Discuss the proposals
	+ Proposed agreement: do not specify L2,max, refer to 38.321

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 8-1: support Option 1. Sub topic 8-2: support Option 1, but note that UL LBT failure recovery is not possible for the target cell. |
| Qualcomm | Sub topic 8-1: We support option 2 and believe it is aligned with existing specification of RAN2. Options 1 or 3 create new and unnecessary UE behavors.Sub topic 8-2: support option 1 and since there will be no L2,max , defining a UE behavior is redundant.  |
| ZTE | Sub topic 8-1:I think Option 2 and our option (Option 3) have similar thinking. I read Huawei’s paper and think what they are actually proposing is “camp on any suitable cell of the indicated RAT”, slightly different than what’s summarized. Anyway, the idea here is that the UE behavior is already defined in 38.304. We take one step further to define the core requirements for the UE to complete camping on the new cell. Suggest to merge Option 2 and 3 and agree on the merged option.Sub topic 8-2:Also similar thinking as Option 2. Besides, we suggest to study the requirement UE shall meet after deciding on the UE behavior. For example, if the behavior is “UE shall camp on any cell” we suggest to also define core requirements for UE to conduct this behavior. Suggest to merge Option 2 and 3 and agree on the merged option. |
| Huawei | Sub topic 8-1: I notice that our proposal is not correctly captured in the Option 2. Which should be like “When the unavailable DMTC cycles during the cell search process exceeds the maximum values, the UE is allowed to camp on any suitable cell of the indicated RAT.” In this way, Option 2 is acceptable since it aligned with RAN2’s spec.Sub topic 8-2: For Ericsson’s comments, we don’t think T311 works for the RRC release with redirection here.Moderator: but which option for sub topic 8-2, does Huawei support? |
| Apple | Sub-topic 8-1: we support option 2, the UE behavior is clearly captured in TS38.304.Sub-topic 8-2: support option 1. |
| Nokia | Sub-topic 8-1: Agree with the idea in Option 2, which follows RAN2 procedures. However, we should not capture this text in RAN4 specification, just include a clarification that the procedure detailed in TS 38.304 also applies in case L1max is exceeded.Sub-topic 8-2: Agree that RAN4 should just refer to 38.321. Regarding the UE behavior, our previous comment apply: we should not capture this text in RAN4 specification, just include a clarification that the procedure detailed in TS 38.304 also applies in case L2max is exceeded. |
| MTK | Sub-topic 8-1: support option 2, and no new UE behavior other than RAN2’s specification is necessary to be specified. Sub-topic 8-2: support option 1. |
| Intel  | Sub topic 8-1: support Option 1 because after the too long UL LBT failure, there is no valid sync timing. As a result the new cell identification procedure shall be restarted. |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#8-1** | *Tentative agreements:* *Candidate options:** + Option 1 (Ericsson): UE shall restart the identification of the target cell on the carrier configured for RRC connection release with redirection. UE can restart at least *N* times (e.g., *N* =3). Upon exceeding *N* the UE shall initiate cell selection procedures for the selected PLMN as defined in TS 38.304.
	+ Option 2 (Huawei): When the unavailable DMTC cycles during the cell search process exceeds the maximum values, the UE is allowed to camp on any suitable cell of the indicated RAT.
	+ Option 3 (ZTE): Camp on any suitable cell of the indicated RAT within a limited time, after which the UE shall start to send random access to the target NR cell within TSI-NR + (1+L2)\*TRACH.

*Recommendations for 2nd round:* no consensus, further discussion is needed |
| **Sub-topic#8-2** | *Tentative agreements:* do not specify L2,max, refer to 38.321*Recommendations for 2nd round:* If the above is agreeable, no need for the 2nd round. Otherwise further discuss. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 8-1: support Option 1. Sub topic 8-2: support proposed agreement in the recommended WF |
| Qualcomm | Sub topic 8-1: we disagree with option 1. The new option 2 has been modified from what it was in the 1st round based on the comment from only one company (ZTE). The options do not reflect the majority of views in the 1st round. We can agree to the following: “When the unavailable DMTC cycles during the cell search process exceeds the maximum values, the UE is allowed to camp on any suitable cell of the indicated RAT* FFS whether camping on any suitable cell shall be within a limited time, after which the UE shall start to send random access to the target NR cell within TSI-NR + (1+L2)\*TRACH.”

Sub topic 8-2: support proposed agreement in the recommended WF. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #9: RRC Re-Establishment

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.3 | R4-2000048 | ZTE | **Observation 1**: The UE behavior in cell selection is well defined by RAN2 spec TS 38.331.Proposal 1: There is no need to define K1 and K2,i and UE behavior while exceeding K1,max and K2,i,max.**Observation 2**: The UE behavior in PRACH transmission is already defined by RAN2 spec TS 38.331.**Proposal 2**: There is no need to define K3 and UE behavior while exceeding K3,max. |
| R4-2000926 | MediaTek Inc. | **Observation 1**: New UE behavior upon exceeding the maximum values will have RAN2 impact.**Proposal 1**: Use the existing RAN2 procedure upon the expiring of the T311 timer. Not to specify K1,max, K2,i,max, and KSI,max. |
| R4-2001556 | Huawei, HiSilicon | **Observation 1**: The requirements of cell search (both intra-frequency and inter-frequency) and the time for acquiring system information are restricted by T311**Proposal 1**: UE behavior should follow existing T311 and no addition UE behaviors are needed for cell search and acquiring system information, which is the Option 2 in the WF.**Observation 2**: UE will continuously attempt to transmit PRACH until the expiration of T301.**Proposal 2**: UE behaviour for PRACH transmission should follow the existing T301, which means and K3,max is not needed. |
| R4-2002133 | Qualcomm Inc. | **Observation 1**: RAN2 specs show that network can configure lbt-FailureInstanceMaxCount, the maximum number of LBT failures that UE should experience before starting LBT failure recovery mechanisms.**Observation 2**: RAN2 is currently discussing to make ‘LBT failure recovery mechanism’ a UE capability feature. **Proposal 1**: Value of L2,max and K3,max do not need to be defined for RRC release with redirection request and RRC re-establishment delay.* During these procedures, the UEs that support UL LBT failure recovery feature, take one of the following two steps:
	+ - perform LBT failure recovery procedure (as shown in 38.321) if they experience lbt-FailureInstanceMaxCount backoffs due to LBT before the expiration of T311 timer or
		- return to idle mode after the expiration of T311 timer if they don't experience  lbt-FailureInstanceMaxCount backoffs due to LBT before the expiration of T311 timer.
* The UEs that don’t support UL LBT failure recovery feature try to transmit PRACH up to preambleTransMax attempts and return to idle mode after the expiration of T311 timer.

**Proposal 2**: RAN4 agrees to include the following text within the ‘random access’ section of 38.133:“If UE cannot transmit random access preamble due to LBT failure, it will perform the random access resource selection procedure defined in clause 5.1.2 in TS 38.321.” |
| R4-2001846 | Ericsson | **Observation 1**: RRC re-establishment timer (T311) can have very large value up to 30 seconds. **Proposal 1**: Use option 3 (i.e. UE behavior is based on K1,max, K2,i,max, and KSI,max (FFS K3,max) and timer T311, whichever comes first) and specify corresponding UE behavior. **Observation 2**: The cell search delay (Tidentify-NR) in RRC connection re-establishment procedure correspond to or at least include L1 filtered SS-RSRP measurement.**Proposal 2**: When K1 exceeds K1,max for intra-frequency case or when K2,i exceeds K2,i,max for inter-frequency case, the UE shall restart the identification of the target cell on the carrier(s) configured for RRC connection re-establishment. **Proposal 3**: UE behaviour upon missed SI occasions exceeding KSI,max needs to be defined once the methodology for specifying the SI acquisition in NR-U is agreed. **Observation 2**: According to the RAN2 procedure the UE upon reaching consistent uplink LBT failures on PRACH in PCell shall declare RLF.**Proposal 4**: The parameter, maximum allowed number of missed PRACH occasions (K3,max), shall not be specified by RAN4. **Proposal 5**: Maximum allowed number of missed SMTC cycles for cell identification of an unknown intra-frequency cell is expressed in table 1:**Table 1: Maximum allowed number of missed SMTC cycles for identification of unknown intra-frequency cell**

|  |  |
| --- | --- |
| **SMTC period (TSMTC)** | **Maximum allowed number of missed SMTC cycles (K1,max)** |
| TSMTC ≤ 40 ms | 24 |
| TSMTC > 40 ms | 16 |

**Proposal 6**: Maximum allowed number of missed SMTC cycles for cell identification of an unknown inter-frequency cell is expressed in table 2:**Table 2: Maximum allowed number of missed SMTC cycles for identification of unknown intra-frequency cell**

|  |  |
| --- | --- |
| **SMTC period (TSMTC, i)** | **Maximum allowed number of missed SMTC cycles (**K2.i,max**)** |
| TSMTC, i ≤ 40 ms | 20 |
| TSMTC, i > 40 ms | 12 |

 |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Agreement from RAN4#93:

* FFS UE behavior upon exceeding K1,max and K2,i,max
* FFS UE behavior upon exceeding K3,max
* UE behavior:
	+ Option 1:
		- UE behavior is based on K1,max, K2,i,max, and KSI,max (FFS K3,max)
			* KSI,max is the maximum time for SI reading
	+ Option 2:
		- Use the existing RAN2 procedure upon the expiring of the T311 timer
	+ Option 3:
		- UE behavior is based on K1,max, K2,i,max, and KSI,max (FFS K3,max) and timer T311, whichever comes first

### Sub-topic 9-1

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 9-1: UE behaviour upon exceeding K1,max and K2,i,max**

* Proposals
	+ Option 1 (Ericsson): Use option 3 agreed in RAN4#93 (i.e. UE behaviour is based on K1,max/K2,i,max and timer T311, whichever comes first) and specify corresponding UE behaviour. When K1 exceeds K1,max for intra-frequency case or when K2,i exceeds K2,i,max for inter-frequency case, the UE shall restart the identification of the target cell on the carrier(s) configured for RRC connection re-establishment.
	+ Option 2 (ZTE, MediaTek, Huawei): option 2 in RAN4#93, do not specify K1,max and K2,i,max
* Recommended WF
	+ Discuss the proposals

### Sub-topic 9-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 9-2: UE behaviour upon exceeding K3,max**

Proposals

* + Option 1 (Ericsson, ZTE, Huawei, Qualcomm): do not specify K3,max
* Agreements from the 1st round:
	+ Agreement: do not specify K3,max
* Recommended WF

### Sub-topic 9-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 9-3: UE behaviour upon exceeding KSI,max**

Proposals

* + Option 1 (Ericsson): Use option 3 agreed in RAN4#93 (i.e. UE behaviour is based on KSI,max and timer T311, whichever comes first) and specify corresponding UE behaviour. UE behaviour upon missed SI occasions exceeding KSI,max needs to be defined once the methodology for specifying the SI acquisition in NR-U is agreed.
	+ Option 2 (MediaTek, Huawei): option 2 in RAN4#93, do not specify KSI,max
* Recommended WF
	+ Discuss the proposals

### Sub-topic 9-4

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 9-4: Values for K1,max**

Proposals

* Option 1 (Ericsson): Maximum allowed number of missed SMTC cycles for cell identification of an unknown intra-frequency cell is expressed in table 1:

**Table 1: Maximum allowed number of missed SMTC cycles for identification of unknown intra-frequency cell**

|  |  |
| --- | --- |
| **SMTC period (TSMTC)** | **Maximum allowed number of missed SMTC cycles (K1,max)** |
| TSMTC ≤ 40 ms | 24 |
| TSMTC > 40 ms | 16 |

* Recommended WF
	+ Discuss the proposals

### Sub-topic 9-5

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 9-5: Values for K2,i,max**

Proposals

* Option 1 (Ericsson): Maximum allowed number of missed SMTC cycles for cell identification of an unknown inter-frequency cell is expressed in table 2:

**Table 2: Maximum allowed number of missed SMTC cycles for identification of unknown intra-frequency cell**

|  |  |
| --- | --- |
| **SMTC period (TSMTC, i)** | **Maximum allowed number of missed SMTC cycles (**K2.i,max**)** |
| TSMTC, i ≤ 40 ms | 20 |
| TSMTC, i > 40 ms | 12 |

* Recommended WF
	+ Discuss the proposals

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 9-1: timer T311 can be quite long. Support Option 1 (=option 3 agreed in RAN4#93)Sub topic 9-2: support option 1, but note that UL LBT failure recovery is not possible for the target cell, so it’s only the T311 timer that decidesSub topic 9-3: timer T311 can be quite long. Support Option 1 (=option 3 agreed in RAN4#93)Sub topic 9-4: support option 1Sub topic 9-5: support option 1 |
| Qualcomm | Sub topic 9-1: We support option 2. If 30s is too long a timer for T311, then why is it configured by the NW? UE should not be required to handle NW misconfiguration of RRC parameters. Sub topic 9-2: We support option 1 and, as mentioned earlier, believe persistent UL LBT failure mechanism is applicable here.Moderator: in Qualcomm’s paper, the proposal is actually option 1 not option 2 (there is even no option 2 for issue 9-2 above). So, do you support Option 1?Thanks for noticing this error. Yes, we meant option 1. Sub topic 9-3: We support option 2 as mentioned above. Also, as noted earlier, 1280ms for TSI,NR is proper for NR-U. Sub topic 9-4: . We made errors in our comments. No specification of a value is needed. Sub topic 9-5: We made errors in our comments. No specification of a value is needed. |
| ZTE | Sub topic 9-1: Support Option 2.Sub topic 9-2: Support Option 1.Sub topic 9-4: Don’t think this is needed. Shall first decide on 9-1.Sub topic 9-5: Don’t think this is needed. Shall first decide on 9-1. |
| Huawei |  Sub topic 9-1: Option 2. There is no need to define K1,max and K2,i,max with presence of T311. |
| Apple | Sub-topic 9-1: support option 2. It can be left to T311 control.Sub topic 9-2: support option 1.Sub topic 9-3: support option 2. It can be left to T311 control.Sub-topic 9-4: fine with Ericsson option.Sub-topic 9-5: fine with Ericsson option, the typo in the table title shall be revised to “unknown inter-frequency cell” |
| Nokia | Sub-topic 9-1 Option 2. The RAN2 procedure is sufficient, nothing is needed in RAN4.Sub-topic 9-2 Option 1 is agreeable.Sub-topic 9-3 Option 2 is preferable in our view. But this issue depends on other topics. Sub-topic 9-4 Do not specify this value.Sub-topic 9-5 Do not specify this value. |
| MTK | Sub-topic 9-1: support option 2. It can be left to T311 control.Sub topic 9-2: support option 1. Sub topic 9-3: support option 2. It can be left to T311 control.Sub-topic 9-4: as discussed in 9-1, **K1,max** is not necessary to be specified.Sub-topic 9-5: as discussed in 9-1, **K2,max** is not necessary to be specified. |
| Intel | Sub topic 9-1: We support option 2 |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#9-1** | *Tentative agreements:* *Candidate options:** + Option 1: Use option 3 agreed in RAN4#93 (i.e. UE behaviour is based on K1,max/K2,i,max and timer T311, whichever comes first) and specify corresponding UE behaviour. When K1 exceeds K1,max for intra-frequency case or when K2,i exceeds K2,i,max for inter-frequency case, the UE shall restart the identification of the target cell on the carrier(s) configured for RRC connection re-establishment.
	+ Option 2: option 2 in RAN4#93, do not specify K1,max and K2,i,max

*Recommendations for 2nd round:* no consensus, further duscussion is needed |
| **Sub-topic#9-2** | *Tentative agreements:* do not specify K3,max*Candidate options:**Recommendations for 2nd round:* if the above is agreeable, no need in the 2nd round for this sup topic. Otherwise further discuss. |
| **Sub-topic#9-3** | *Tentative agreements:**Candidate options:** + Option 1 Use option 3 agreed in RAN4#93 (i.e. UE behaviour is based on KSI,max and timer T311, whichever comes first) and specify corresponding UE behaviour. UE behaviour upon missed SI occasions exceeding KSI,max needs to be defined once the methodology for specifying the SI acquisition in NR-U is agreed.
	+ Option 2: option 2 in RAN4#93, do not specify KSI,max

*Recommendations for 2nd round:* no consensus, further duscussion is needed |
| **Sub-topic#9-4** | *Tentative agreements:* *Candidate options:** Option 1: Maximum allowed number of missed SMTC cycles for cell identification of an unknown intra-frequency cell is expressed in table 1:

**Table 1: Maximum allowed number of missed SMTC cycles for identification of unknown intra-frequency cell**

|  |  |
| --- | --- |
| **SMTC period (TSMTC)** | **Maximum allowed number of missed SMTC cycles (K1,max)** |
| TSMTC ≤ 40 ms | 24 |
| TSMTC > 40 ms | 16 |

*Recommendations for 2nd round:* no consensus on the related sub topic 9-1, further discuss depending on the outcome of sub topic 9-1 |
| **Sub-topic#9-5** | *Tentative agreements:* *Candidate options:** Option 1: Maximum allowed number of missed SMTC cycles for cell identification of an unknown inter-frequency cell is expressed in table 2:

**Table 2: Maximum allowed number of missed SMTC cycles for identification of unknown intra-frequency cell**

|  |  |
| --- | --- |
| **SMTC period (TSMTC, i)** | **Maximum allowed number of missed SMTC cycles (**K2.i,max**)** |
| TSMTC, i ≤ 40 ms | 20 |
| TSMTC, i > 40 ms | 12 |

*Recommendations for 2nd round:* no consensus on the related sub topic 9-1, further discuss depending on the outcome of sub topic 9-1 |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 9-1: timer T311 can be quite long. The long timer is not a misconfiguration as claimed by some company, but it is to accommodate different phases of the entire procedure. However, if some phase (e.g., the cell identification procedure) has already taken too long time, there is no point in wasting the UE resources by the rest of the timer if we know that the UE is likely to fail in the end anyway. Support Option 1 (=option 3 agreed in RAN4#93)Sub topic 9-3: timer T311 can be quite long. Support Option 1 (=option 3 agreed in RAN4#93)Sub topic 9-4: support option 1Sub topic 9-5: support option 1 |
| Qualcomm | Sub topic 9-1: We support option 2. The level of micromanagement and optimization on UE behavior that option 1 seeks is unnecessary. Sub topic 9-2: We support option 2. Same comment as sub topic 9-1. Sub topic 9-4 and 9-5: disagree with option 1. Not needed. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #10: SCell Activation

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.4 | R4-2000057 | ZTE | **Proposal 1**: Do not extend the time period in the known condition for the target SCell under NR-U. |
| R4-2000715 | Qualcomm Inc. | **Proposal 1**. NR-U SCell is known if it has been meeting the following conditions: - During the period equal to max([5] measCycleSCell, [5] DRX cycles) before the reception of the SCell activation command: - the UE has sent a valid measurement report for the SCell being activated and - the SSB measured remains detectable according to the cell identification conditions specified in clause 9.2A and 9.3A. - the SSB measured during the period equal to max([5] measCycleSCell, [5] DRX cycles) also remains detectable during the SCell activation delay according to the cell identification conditions specified in 9.2A and 9.3A. Otherwise NR-U SCell is unknown.**Proposal 2**. RAN4 to further discuss the modification of the term “SSB remains detectable” for NR-U. Possible modifications can include the percentage of time within [5] seconds that SSB index identified by UE is available and additionally the number of successive occasions where that SSB index is missed due to DL LBT failure. **Observation 1**. R16 HARQ enhancements – non-numerical K1, enhanced dynamic codebook, and one-shot feedback – provide opportunities for HARQ retransmission resulting in potentially different timelines/delays. Moreover, per R15 HARQ procedure, a failed HARQ transmission is treated as NACK and can be scheduled for retransmission by gNB. It is overly and unnecessarily complicated for RAN4 to define extension of THARQ for all of these scenarios. The procedures are already clearly defined in TS 38.213 specification to which RAN4 requirements can simply refer. **Proposal 3**. RAN4 to not define a time limit, even a fixed one, on THARQ and rely on RAN2 procedure for persistent UL LBT failure.**Proposal 4**. RAN4 to define THARQ as:*“THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]. In the event of UL CCA failure, THARQ extends to the next HARQ feedback retransmission opportunities as specified in TS 38.213 [3].”***Proposal 5**. For known Scell activation and if the SCell measurement cycle is equal to or smaller than 160ms, Tactivation\_time = TFirstSSB + (L1)\* Trs + 5ms (X=5ms) where L1 refers to the number of occasions the reference signal in the SCell being activated is not available and L1 $\leq $ L1,max**Proposal 6**. TFirstSSB\_MAX: is the time to first SSB indicated by the SMTC after n + THARQ+3ms. In case of intra-band SCell activation, the occasion when all active serving cells and SCells being activated or released are *scheduled* to transmit SSB bursts in the same slot. In case of inter-band SCell activation, the first occasion when the SCell being activated is *scheduled* to transmit SSB burst. **Proposal 7**. For NR-U known SCell activation, if the SCell measurement cycle is larger than 160ms, Tactivation\_time = TFirstSSB\_MAX + L2,1\* TSMTC\_MAX + (1 + L2,2)\* Trs + 5ms (Y=5ms) . * L2,2 refers to the number of occasions the reference signal, as indicated by SMTC of the SCell being activated, is not available and L2,2 $\leq $ L2,2,max
* In inter-band scenarios,
	+ L2,1 refers to the number of occasions the reference signal, as indicated by SMTC of the SCell being activated, is not available in known cell conditions and L2,1 $\leq $ L2,1,max
* In intra-band scenarios,
	+ L2,1 refers to the number of occasions that at least one SMTC from SCells already activated or SCell being activated is not available in known cell conditions and L2,1 $\leq $ L2,1,max

**Proposal 8**. For NR-U unknown SCell activation, if the SCell measurement cycle is larger than 160ms, Tactivation\_time = TFirstSSB\_MAX + (1+L3,1)\* TSMTC\_MAX + (2 + L3,2)\* Trs + 5ms (Z=5ms), where* L3,2 refer to the number of occasions the reference signal, as indicated by SMTC of the SCell being activated, is not available L3,2 $\leq $ L3,2,max
* In inter-band scenarios,
	+ L3,1 refers to the number of occasions the reference signal, as indicated by SMTC of the SCell being activated, is not available in unknown cell conditions and L3,1 $\leq $ L3,1,max
* In intra-band scenarios,
	+ L3,1 refers to the number of occasions that at least one SMTC from SCells already activated or SCell being activated is not available in unknown cell conditions and L3,1 $\leq $ L3,1,max

**Proposal 9**. RAN4 to adopt the following max values:* L1,max = 2 if Trs $\leq $ 40ms and L1,max = 1 if Trs $>$ 40ms
* L2,1,max = 2 if TSMTC\_max $\leq $ 40ms and L2,1,max = 1 if TSMTC\_max  $>$ 40ms
* L2,2,max = 2 if Trs $\leq $ 40ms and L2,2,max = 1 if Trs $>$ 40ms
* L3,1,max = 3 if TSMTC\_max $\leq $ 40ms and L2,1,max = 2 if TSMTC\_max  $>$ 40ms
* L3,2,max = 3 if Trs $\leq $ 40ms and L3,2,max = 2 if Trs $>$ 40ms

**Proposal 10**. RAN4 does not need to define a maximum limit on TCSI-ReportingDelay. Existing specifications in RAN1 and RAN2 adequately describe the UE behaviour. **Proposal 11**. L4,max = 2 for TCSI-RS $\leq $ 40ms and L4,max = 1 for TCSI-RS $>$ 40ms**Proposal 12**. With the clarification to the definition of THARQ as in proposals 3-4, the SCell deactivation delay requirement for activated SCell is the same as in Release 15 requirements. **Proposal 13**. The activation interruption on PSCell (Scenario B) or PCell (Scenario A or C) or any activated Scell shall not occur before slot n+1+THARQ */NR\_slot\_length* and not occur after slot n+1*+*(THARQ +3ms + L\*TSMTC\_MAX + TSMTC\_duration)/NR\_slot\_length where THARQ is defined in Proposal 3-4 and L = L1 in known SCell case if the SCell measurement cycle is equal to or smaller than 160ms, L=L2,1 in known SCell case if the SCell measurement cycle is larger than 160ms, and L=L3,1 in unknown SCell case.* RAN4 may need to revisit the interruption window length formulation in R15 specification.

**Proposal 14**. The deactivation interruption on PCell or PSCell or any activated SCell shall not occur before slot n+1+THARQ/*NR\_slot\_length* and not occur after slot n+1+(THARQ +3ms)/ *NR\_slot\_length* where THARQ is defined in Proposal 3-4.  |
|  | R4-2001557 | Huawei, HiSilicon | **Observation 1**: Extending the time period before reception of the SCell activation command won’t bring significant benefits compared with the existing known conditions. **Proposal 1**: Reuse the current known conditions without extension of the time period before reception of the SCell activation command.**Observation 2**: No new UE behavior is needed from RAN4’s perspective. The exact wording should be clarified considering the enhancement and LBT impact.**Proposal 2**: Tharq is the timing between DL data transmission and the successful transmission of acknowledgement scheduled by gNB. |
|  | R4-2001841 | Qualcomm Inc. | CR (38.133) on SCell activation/deactivation |
|  | R4-2001930 | Ericsson | **Proposal 1**: ΔHARQ,max=TBD≤ the remaining time until sCellDeactivationTimer expires if it is configured, otherwise 1280 ms. Upon exceeding ΔHARQ,max the UE can stop attempting to transmit HARQ feedback.**Proposal 2**: The period before the reception of the SCell activation command is extended ΔDL: ΔDL = LDL \* measCycleSCell in non-DRX case, andΔDL=LDL \* max(measCycleSCell, DRX cycle) in DRX case,where LDL (LDL≤LDL,max) is the number of missed cycles at the UE due to DL LBT failures.**Proposal 3**: LDL,max is as defined for intra-frequency measurements, upon exceeding LDL,max the UE may consider the SCell as unknown.**Proposal 4**: The period can be further extended by ΔUL due to UL LBT, to account for the measurement reporting delay due to UE inability to send a valid measurement report on a carrier frequency with CCA (ΔUL=0 for UL channel access category 1).**Proposal 5**: Upon exceeding ΔUL,max, the SCell can be considered unknown.**Proposal 6:** ΔCSI,max=TBD≤ the remaining time until sCellDeactivationTimer expires if it is configured, otherwise 1280 ms.**Proposal 7:** L1, L2,1, L2,2, L3,1, L3,2 are the numbers of SSB occasions not available at the UE due to DL LBT failures **Proposal 8**: For a known SCell:- TFirstSSB+ Trs \*L1+ 5ms, if the SCell measurement cycle is equal to or smaller than 160ms and ΔHARQ≤80 ms.- (TSMTC\_MAX + Trs )\*(1+L2)+ 5ms, if the SCell measurement cycle is larger than 160ms or ΔHARQ>80 ms. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Agreement from RAN4#93:

Interruption window: Confirm RAN4#92-bis agreement on extending THARQ compared to Rel-15

* The exact wording is TBD
* FFS whether the extension depends on UE capability

Known cell definition: Extend the time before the reception of the SCell activation command from Rel-15 time TNR to time TNR-U

* Option 1: TNR-U = max([5+k] measCycleSCell,  [5+k] DRX cycles), k=TBD>0 and k is a fixed number
* Option 2: do not extend

Scell activation delay:

* THARQ
	+ Confirm RAN4#92-bis agreement on extending THARQ compared to Rel-15
		- The exact wording is TBD
		- FFS whether the extension depends on UE capability
* TCSI\_reporting
	+ Confirm RAN4#92-bis agreement on extending TCSI\_reporting compared to Rel-15 (TCSI\_reporting,ref) and also add the DL impact:
		- TCSI\_reporting = TCSI\_reporting,ref +L4\*TCSI-RS +ΔCSI
			* UE behavior upon exceeding L4,max (L4,max=TBD) is to abandon the SCell activation procedure
			* ΔCSI ≤ ΔCSI,max
			* FFS ΔCSI,max
				+ Option 1: ΔCSI,max is determined by RAN1/RAN2 specifications
				+ Option 2: ΔCSI,max is a pre-defined value
* Tactivation\_time
	+ Tactivation\_time is extended to compensate for signal occasions not available at the UE
	+ Known cell
		- TFirstSSB+ Trs \*L1+ X ms, if the SCell measurement cycle is ≤160ms
			* FFS: “and ΔHARQ≤TBD”
		- TSMTC\_MAX\*(1+L2,1) + Trs\*(1+L2,2)+ Y ms, if the SCell measurement cycle is >160ms
			* FFS: “or ΔHARQ>TBD”
	+ Unknown cell
		- TSMTC\_MAX\*(2+L3,1)+ Trs\*(2+L3,2)+ Z ms, provided the SCell can be successfully detected in one attempt
	+ UE behavior upon exceeding L1,max, L2,1,max, L2,2,max, L3,1,max, and L3,2,max: abandon SCell activation procedure
	+ L1≤L1,max, L2,1≤L2,1,max, L2,2≤ L2,2,max, L3,1≤ L3,1,max, and L3,2≤ L3,2,max
		- The exact definition of L1, L2,1, L2,2, L3,1, L3,2 is FFS
* SCell deactivation: Confirm RAN4#92-bis agreement on extending THARQ compared to Rel-15
	+ The exact wording is TBD
	+ FFS whether the extension depends on UE capability

### Sub-topic 10-1

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 10-1: known SCell definition**

* Proposals
	+ Option 1: TNR-U = max([5+k] measCycleSCell,  [5+k] DRX cycles), k=TBD>0 and k is a fixed number
	+ Option 2: do not extend the time period in the known SCell condition
	+ Option 3: do not extend the time period in the known SCell condition, but add an additional condition on “SSB remains detectable” to set the minimum percentage of time [5] seconds during which the SSB is available
	+ Option 4: The period before the reception of the SCell activation command is extended by ΔDL:
		- ΔDL = LDL \* measCycleSCell in non-DRX case, and
		- ΔDL=LDL \* max(measCycleSCell, DRX cycle) in DRX case,
		- where LDL (LDL≤LDL,max) is the number of missed cycles at the UE due to DL LBT failures, and LDL,max is as defined for intra-frequency measurements, upon exceeding LDL,max the UE may consider the SCell as unknown.
	+ Option 5: The period before the reception of the SCell activation command is extended by ΔDL+ ΔUL, to account for both DL and UL failures.
* Agreements from the 1st round:
	+ Agreement: do not extend the time period in the known SCell condition
* Recommended WF
	+ -

### Sub-topic 10-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 10-2: THARQ**

Proposals

* + Option 1: THARQ is extended by ΔHARQ,max=TBD≤ the remaining time until sCellDeactivationTimer expires if it is configured, otherwise (when not configured) 1280 ms. Upon exceeding ΔHARQ,max the UE can stop attempting to transmit HARQ feedback.
	+ Option 2: Tharq is extended to account for UL LBT failures and is the timing between DL data transmission and the *successful* transmission of acknowledgement scheduled by gNB.
	+ Option 3: THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]. In the event of UL CCA failure, THARQ extends to the next HARQ feedback retransmission opportunities as specified in TS 38.213 [3].
* Recommended WF
	+ Proposed agreement:
		- THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213. In the event of UE not being able to transmit the acknowledgment due to UL CCA failures on this carrier: THARQ is extended to also include the time to all next HARQ feedback retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213; no extension of THARQ due to UL LBT failures is allowed for channel access category 1.
		- FFS: UE behavior and the maximum extension of THARQ due to UL LBT failures when sCellDeactivationTimer is not configured

### Sub-topic 10-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 10-3: SCell activation delay, ΔCSI,max**

Proposals

* Option 1: ΔCSI,max=TBD≤ the remaining time until sCellDeactivationTimer expires if it is configured, otherwise (if not configured) 1280 ms.
* Option 2: no need to explicitly define ΔCSI,max, only refer to RAN2 specification.
* Recommended WF
	+ Proposed agreement:
		- TCSI\_reporting = TCSI\_reporting,ref +L4\*TCSI-RS +ΔCSI, where
			* TCSI\_reporting,ref is CSI reporting delay as specified in section 8.3.2,
			* UE behavior upon exceeding L4,max (L4,max=TBD) is to abandon the SCell activation procedure,
			* ΔCSI  is the total additional delay in CSI reporting due to UL LBT failures, according to TS 38.213.

### Sub-topic 10-4

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 10-4: SCell activation delay, condition on HARQ delay**

Proposals

* Option 1: For a known SCell:
	+ TFirstSSB+ Trs \*L1+ 5ms, if the SCell measurement cycle is ≤160ms and **ΔHARQ≤[TBD] ms**.
	+ (TSMTC\_MAX + Trs )\*(1+L2)+ 5ms, if the SCell measurement cycle is >160ms or **ΔHARQ>[TBD] ms**,

where **ΔHARQ** is the total time by which THARQ was extended due to UL LBT failures according to the agreement on sub topic 10-2

* Option 2: Option 1 without the condition on **ΔHARQ**
* Recommended WF
	+ Discuss the two options above

### Sub-topic 10-5

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 10-5: SCell activation delay, max L-values**

Proposals

* Option 1:
	+ L1,max = 2 if Trs $\leq $ 40ms and L1,max = 1 if Trs $>$ 40ms
	+ L2,1,max = 2 if TSMTC\_max $\leq $ 40ms and L2,1,max = 1 if TSMTC\_max  $>$ 40ms
	+ L2,2,max = 2 if Trs $\leq $ 40ms and L2,2,max = 1 if Trs $>$ 40ms
	+ L3,1,max = 3 if TSMTC\_max $\leq $ 40ms and L2,1,max = 2 if TSMTC\_max  $>$ 40ms
	+ L3,2,max = 3 if Trs $\leq $ 40ms and L3,2,max = 2 if Trs $>$ 40ms
	+ L4,max = 2 for TCSI-RS $\leq $ 40ms and L4,max = 1 for TCSI-RS $>$ 40ms
* Recommended WF
	+ Proposed agreement: Postpone the discussion to the next meeting

### Sub-topic 10-6

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 10-6: SCell activation delay, definitions of L parameters**

Proposals

* Option 1:
	+ Known SCell
		- L1 (L1≤L1,max) is the number of occasions the reference signal in the SCell being activated is not available
		- L2,1 (L2,1≤ L2,1,max)
			* inter-band scenarios: the number of occasions the reference signal, as indicated by SMTC of the SCell being activated, is not available in known cell conditions
			* intra-band scenarios: the number of occasions that at least one SMTC from SCells already activated or SCell being activated is not available in known cell conditions
		- L2,2 (L2,2≤ L2,2,max) is the number of occasions the reference signal, as indicated by SMTC of the SCell being activated, is not available
	+ Unknown SCell
		- L3,1 (L3,1≤ L3,1,max)
			* inter-band scenarios: the number of occasions the reference signal, as indicated by SMTC of the SCell being activated, is not available in unknown cell conditions
			* intra-band scenarios: the number of occasions that at least one SMTC from SCells already activated or SCell being activated is not available in unknown cell conditions
		- L3,2 (L3,2≤ L3,2,max) is the number of occasions the reference signal, as indicated by SMTC of the SCell being activated, is not available
* Recommended WF
	+
	+ Proposed agreement: Postpone the discussion to the next meeting

### Sub-topic 10-7

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 10-7: SCell activation delay, X, Y, Z (see the agreement in RAN4#93)**

Proposals

* Option 1:
	+ X=5 ms
	+ Y=5 ms
	+ Z=5 ms
* Agreements from the 1st round:

Agreement:

* + X=5 ms
	+ Y=5 ms
	+ Z=5 ms
* Recommended WF

### Sub-topic 10-8

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 10-8:** **Does the interruption window length at SCell activation depend on DL LBT failures?**

Proposals

* Option 1: no (already agreed in previous meetings)
* Option 2: yes, for activation interruption only.
	+ For example: The activation interruption on PSCell (Scenario B) or PCell (Scenario A or C) or any activated Scell shall not occur before slot n+1+THARQ */NR\_slot\_length* and not occur after slot n+1*+*(THARQ +3ms + L\*TSMTC\_MAX + TSMTC\_duration)/NR\_slot\_length where THARQ is extended due to UL LBT failures, and L = L1 in known SCell case if the SCell measurement cycle is equal to or smaller than 160ms, L=L2,1 in known SCell case if the SCell measurement cycle is larger than 160ms, and L=L3,1 in unknown SCell case.
* Agreements from the 1st round:
	+ Conclusion: postpone discussion till R15 get agreed
* Recommended WF

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 10-1: the time has to be extended, otherwise the cell will be frequently considered as unknown, which will lead to much longer SCell activation and more UE power consumption.Sub topic 10-2: support option 1, since the timer may be not always configured or can be quite long (no need to keep trying to transmit until the long timer expires)Sub topic 10-3: support option 1, since the timer may be not even configuredSub topic 10-4: support option 1, since the UE may need e.g. to redo AGC if the HARQ retransmissions have taken too long time. Clarification on AGC impact: There may be not so frequent opportunities for the UE to retransmit HARQ in NR-U and furthermore, this may also be impacted by RAN2 agreements on UL LBT failures recovery for the transmissions carrying ACK/NACK.Sub topic 10-5: Sub topic 10-6:Sub topic 10-7:Sub topic 10-8: general issue, not related to NR-U, should be treated under Rel-15 where there are also some contributions related to this; furthermore, widening the interruption window will result in that the network will not avoid scheduling since the interruption occurrence becomes too uncertain. |
| Qualcomm | Sub topic 10-1: We support option 3 but can compromise to option 2. There is no need to extend the time. Extension of time for known cell definition in measurement has nothing to do with SCell activation. It is reminded that LTE LAA didn’t extend the known time either.Sub topic 10-2: We don’t think there is a material difference between options 2 and 3. We oppose option 1 and do not understand what “timer” is being referred to. HARQ retransmission opportunities refer to PUSCH retransmission and are significantly smaller than 1280ms.Sub topic 10-3: We support option 2 and again do not understand what “timer” is being referred to here. See comments on Sub topic 10-2 and also comments on measurement reporting delay issues in email discussion #48.Sub topic 10-4: We do not support option 1. There is no need to bring up **ΔHARQ .** Our proposal on this topic (Proposal 5 of R4-2000715) is not reflected as an option and is added in the text above. HARQ retransmission do not take too long to necessitate retuning AGC.Moderator: it’s option 2 now.We support option 2.Sub topic 10-8: The interruption window defined in R15 for Scell activation does not reflect the activation timeline. We understand the R15 spec may also be fluid and can visit this once R15 spec is more concrete. |
| ZTE | Sub topic 10-1: Support Option 2, don’t see need to extend the period. |
| Huawei | Sub topic 10-1: Option 2/3. The know condition is to indicate the time period that the measurement remains valid. If the measurement report is dropped due to LBT, extending the time period before receiving the activation command won’t bring benefits. It means the measure report should be valid for longer period.Sub topic 10-2: Option 2. When the HARQ feedback is dropped due to LBT, gNB will schecule for the retransmission or the LBT recovery will be trigged. Thus, there is no need to define a limits for the HARQ process, and only the wording needs to be modified. The SCell activation will only proceed when the HARQ feedback is successfully transmitted.  |
| Apple | Sub topic 10-1: Support option 2. Extending time period for known condition is an additional requirement for UE to maintain the timing with a longer period compared with legacy UE. Don’t need to differentiate this capability of maintaining timing between legacy CC and unlicensed CC, i.e., it’s shall be defined as UE specific rather than SCC-type specific.Sub topic 10-2: Support option 3 based on TS38.213 definition.Sub topic 10-3: Support option 2. |
| Nokia | Sub-topic 10-1 Option 1, to extend the known condition. Sub-topic 10-2 Option 3. We agree with Qualcomm’s paper: "It is overly and unnecessarily complicated for RAN4 to define extension of THARQ for all of these scenarios. The procedures are already clearly defined in TS 38.213 specification to which RAN4 requirements can simply refer"Sub-topic 10-3 Option 2. Only refer to RAN2 specification.Sub-topic 10-4 This issue depends on the agreements on issue 10-2. We cannot agree to option 1.Sub-topic 10-8 Postpone the discussion until R15 specification is more concrete. |
| MTK | Sub topic 10-1: Support option 2. One concern on option 3 is UE would be required to detect on each SSB to determine the “percentage”. Sub topic 10-2: option 2 and option 3 are both fine for us. Sub topic 10-3: Support option 2. |
| Intel | Sub topic 10-1: Support option 2 or 3. Because the timing and cell ID information can be expired up to the time duration only no matter what reason introduce such unavailable maintenance signal. Sub topic 10-2: Support option 2Sub topic 10-3: Support option 2, which can up to RAN2.Sub topic 10-4: Option 1 is fine for us  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001841 | Nokia: there are too many open issues in this topic, it is not possible to agree with this CR. |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#10-1** | *Tentative agreements:* do not extend the time period in the known SCell condition*Candidate options:**Recommendations for 2nd round:* if the above is agreeable, no need for the 2nd round. Otherwise further discuss. |
| **Sub-topic#10-2** | *Tentative agreements:* THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213. In the event of UE not being able to transmit the acknowledgment due to UL CCA failures on this carrier: for channel access category different than channel access category 1, THARQ is extended to also include the time to all next HARQ feedback retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213. No extension of THARQ due to UL LBT failures is allowed for channel access category 1.Further discuss:* What is the UE behaviour and the maximum extension of THARQ due to UL LBT failures when sCellDeactivationTimer is not configured?

*Candidate options:**Recommendations for 2nd round:* Further discuss:* What is the UE behaviour and the maximum extension of THARQ , in presence of UL LBT failures, when sCellDeactivationTimer is not configured?
 |
| **Sub-topic#10-3** | From RAN4#93 agreements:* TCSI\_reporting
	+ Confirm RAN4#92-bis agreement on extending TCSI\_reporting compared to Rel-15 (TCSI\_reporting,ref) and also add the DL impact:
		- TCSI\_reporting = TCSI\_reporting,ref +L4\*TCSI-RS +ΔCSI
			* UE behavior upon exceeding L4,max (L4,max=TBD) is to abandon the SCell activation procedure
			* ΔCSI ≤ ΔCSI,max
			* FFS ΔCSI,max
				+ Option 1: ΔCSI,max is determined by RAN1/RAN2 specifications
				+ Option 2: ΔCSI,max is a pre-defined value

*Tentative agreements:* TCSI\_reporting = TCSI\_reporting,ref +L4\*TCSI-RS +ΔCSI, where* TCSI\_reporting,ref is CSI reporting delay as specified in section 8.3.2,
* UE behavior upon exceeding L4,max (L4,max=TBD) is to abandon the SCell activation procedure,
* ΔCSI  is the total additional delay in CSI reporting due to UL LBT failures, according to TS 38.213.

*Candidate options:**Recommendations for 2nd round:*  |
| **Sub-topic#10-4** | *Tentative agreements:* *Candidate options:** Option 1: For a known SCell:
	+ TFirstSSB+ Trs \*L1+ 5ms, if the SCell measurement cycle is ≤160ms and **ΔHARQ≤[TBD] ms**.
	+ (TSMTC\_MAX + Trs )\*(1+L2)+ 5ms, if the SCell measurement cycle is >160ms or **ΔHARQ>[TBD] ms**,

where **ΔHARQ** is the total time by which THARQ was extended due to UL LBT failures according to the agreement on sub topic 10-2.* Option 2: Option 1 without the condition on **ΔHARQ**

*Recommendations for 2nd round:* further discuss options 1 and 2. |
| **Sub-topic#10-5** | *Tentative agreements:* *Candidate options:**Recommendations for 2nd round:* further discussion is needed |
| **Sub-topic#10-6** | *Tentative agreements:* *Candidate options:**Recommendations for 2nd round:* further discussion is needed |
| **Sub-topic#10-7** | *Tentative agreements:* * + X=5 ms
	+ Y=5 ms
	+ Z=5 ms

*Candidate options:**Recommendations for 2nd round:* if the above is agreeable, no need for the second round. Otherwise, further discussion is needed. |
| **Sub-topic#10-8** | *Tentative agreements:* Option 1 (the interruption window length at SCell activation does not depend on DL LBT failures) was already agreed in previous meetings. Assume option 1 and develop the corresponding requirements in the CR on SCell activation for NR-U. The requirement can be revisited to align with Rel-15, after the changes for Rel-15 specification get agreed.*Candidate options:**Recommendations for 2nd round:*  |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2001841 | Focus on the technical discussion, postpone the CR discussion |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 10-2: support proposed agreements in the recommended WFSub topic 10-3: support proposed agreement in the recommended WFSub topic 10-4: support option 1, since the UE may need e.g. to redo AGC if the HARQ retransmissions have taken too long time. Clarification on AGC impact: There may be not so frequent opportunities for the UE to retransmit HARQ in NR-U and furthermore, this may also be impacted by RAN2 agreements on UL LBT failures recovery for the transmissions carrying ACK/NACK.Sub topic 10-5: support the proposed agreement in the recommended WFSub topic 10-6: support the proposed agreement in the recommended WF |
| Qualcomm | Sub topic 10-2: The definition of THARQ needs the following correction in the recommended WF:The phrase that is shaded in yellow below should be removed:“THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213. In the event of UE not being able to transmit the acknowledgment due to UL CCA failures on this carrier: for channel access category different than channel access category 1, THARQ is extended to also include the time to all next HARQ feedback retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213. No extension of THARQ due to UL LBT failures is allowed for channel access category 1.”“on this carrier” is ambiguous and not necessary. HARQ is sent over carriers that are already active which can be either NR or NR-U carriers. Also, channel access cateogy 1 is already mentioned in the last sentence of the paragraph and it is not necessary to mention it twice. Regarding UE behavior when max HARQ is reached (per RAN2), it stops Scell activation. This is regardless of whether the s*CellDeactivationTimer* is configured or not. Moreover, the max HARQ in RAN2 spec is not related to s*CellDeactivationTimer*Sub topic 10-4: we support option 2. Option 1 is not consistent with earlier tentative agreements and does not make sense. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #11: PSCell Addition

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.5 | R4-2000058 | ZTE | **Proposal 1**: Do not extend the time period in the known condition for the target PSCell under NR-U. |
| R4-2000716 | Qualcomm Inc. | **Proposal 1**. The formulation of delay component due to PRACH in PSCell addition for NR-U to be amended to account for UL CCA failure:TPSCell\_ DU\_withCCA = TPSCell\_ DU  + LRACH.TRACHwhere TPSCell\_ DU is identical to its definition in R15, LRACH is the number of RACH association periods missed due to UL CCA failure and TRACH is the periodicity of RACH association period associated with the detected SS/PBCH block for PSCell addition. **Proposal 2**. RAN4 to not define a maximum value for LRACH as the process is already governed by several procedures already defined in RAN1 and/or RAN2 (e.g., T304 timer and/or exceeding the threshold for persistent UL LBT failure).**Observation 1**. The agreement in RAN4#93 to extend the duration of the condition of the cell to remain known in RRC\_CONNECTED state from 5 seconds to 8 seconds does not automatically imply that the duration for PSCell to remain known should also be extended. During the measurements in RRC\_CONNECTED, UE can be configured with very long DRX cycles and to ensure that, in longer DRX cycles, at least one LBT failure is tolerated, the definition of known cell is extended. While longer DRX cycles are not prohibited in the specification from being configured immediately preceding the PSCell addition command, it is not a reasonable operational scenario and such case should not be driving the RRM requirements.**Proposal 3**. NR-U PSCell is known if it has been meeting the following conditions: During the last [5] seconds before the reception of the NR-U PSCell configuration command: * the UE has sent a valid measurement report for the NR-U PSCell being configured and
* One of the SSBs measured from the NR-U PSCell being configured remains detectable according to the cell identification conditions specified in section 9.3A of TS 38.133

One of the SSBs measured from NR-U PSCell being configured also remains detectable during the NR-U PSCell configuration delay according to the cell identification conditions specified in section 9.3A of TS 38.133 **Proposal 4**. RAN4 to further discuss the modification of the term “cell remains detectable” for NR-U. Possible modifications can include the percentage of time within [5] seconds that SSB index identified by UE is available and additionally the number of successive occasions where that SSB index is missed due to DL LBT failure. |
|  | R4-2000927 | MediaTek Inc. | **Observation 1**: Stopping PSCell addition procedure upon exceeding L1max and L2max will have RAN2 impact.**Proposal 1**: PSCell addition procedure should not be terminated due to the number of missing DRS occasions exceeds the upper limit. **Proposal 2**: Not to specify L1max and L2max. |
|  | R4-2001558 | Huawei, HiSilicon | **Observation 1**: Extending the time period before reception of the PSCell addition command won’t bring significant benefits compared with the existing conditions.**Proposal 1**: Reuse the current known conditions without extension of the time period before reception of the PSCell configuration command. |
|  | R4-2001842 | Qualcomm Inc. | CR (38.133) on PSCell addition/release |
|  | R4-2001932 | Ericsson | **Proposal 1**: The time between the reception of the PSCell configuration command and measurement/report is extended to 8 sec.**Proposal 2**: RAN4 confirms the agreement in [2]:TPSCell\_ DU is extended by ΔPRACH to account for UL LBT failures (ΔPRACH=0 for channel access category 1). The maximum value of ΔPRACH (ΔPRACH,max) is TBD, upon exceeding which the UE can stop attempting to transmit PRACH and can abandon the PSCell addition procedure. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Agreement from RAN4#93:

Known cell definition: The time between the reception of the PSCell configuration command and measurement/report is

* Option 1: extended from 5 seconds to [8] seconds
* Option 2: not extended

PSCell addition delay:

* L1max=3 for SMTC periodicity >40 ms, L1max=5 for SMTC periodicity ≤40 ms
* L2max=2 for SMTC periodicity >40 ms, L2max=3 for SMTC periodicity ≤40 ms
* Upon exceeding L1max or L2max or upon T304 timer, whichever comes first, the UE shall stop the PSCell addition procedure

### Sub-topic 11-1

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 11-1: known PSCell definition**

* Proposals
	+ Option 1: extended from 5 seconds to [8] seconds
	+ Option 2: not extended
* Agreements from the 1st round:
	+ Agreement: do not extend the time in the known cell condition in PSCell addition delay requirement
* Recommended WF

### Sub-topic 11-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 11-2: PSCell addition delay, ΔPRACH in TPSCell\_ DU**

Proposals

* + Option 1: ΔPRACH is the time until successful transmission, to account for UL LBT failures. The maximum value of ΔPRACH (ΔPRACH,max) is TBD, upon exceeding which the UE can stop attempting to transmit PRACH and can abandon the PSCell addition procedure.
	+ Option 2: ΔPRACH= LRACH\*TRACH, where LRACH is the number of RACH association periods missed due to UL CCA failure and TRACH is the periodicity of RACH association period associated with the detected SS/PBCH block for PSCell addition. The maximum value for LRACH is controlled by several procedures already defined in RAN1 and/or RAN2 (e.g., T304 timer and/or exceeding the threshold for persistent UL LBT failure).
* Recommended WF
	+ Proposed agreement: In the event of UE not being able to transmit PRACH due to UL CCA failures on this carrier: ΔPRACH is the total time extended to also include the time to all next PRACH retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213; ΔPRACH=0 for channel access category 1.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 11-1: the time needs to be extended, since otherwise the PSCell addition will be taking longer time and UE power, because the cell may more frequently or even always be unknown in some deployments or for long DRX. If the time is not extended then in more cases the cell will be treated as unknown, meaning more efforts and more time to add the PSCell. As of DRX, **it’s not the same as for SCell activation where the time is already in DRX cycles**.Sub topic 11-2: support option 1 |
| Qualcomm | Sub topic 11-1: We have removed Ericsson’s interpretation of each option from the above (This is not consistent with the other Topic summaries). Similar to Scell activation (also as in LTE LAA), the known PSCell time does not need to be extended. Concern about large delay that are raised above is paradoxical with the other issue raised above: long DRX cycles. If the concern is taking too long to activate the PSCell, then why would UE be configured with long DRX cycles anyway? In PSCell (or SCell) activation, UE should not even be configured with long DRX cycles. Sup topic 11-2: We support option 2. In the presence of clear RAN1/2 specification to define a UE behavior, RAN4 should not specify anything further.  |
| Huawei | Sub topic 11-1: For the option 2, we didn’t see the implication that the cell will always be treated as unknown with long DRX. Maybe further explanation is needed. The known time does not need to be extended. We share the same views as mentioned in the SCell activation. |
| Apple | Sub topic 11-1: we support option 2. The reason is same as we gave for SCell activation. |
| Nokia | Sub-topic 11-1 Option 1, extend the known PSCell definition, as we also discussed for the SCell definition.Sub-topic 11-2 Option 2. RAN 4 should not specify a maximum number of LRACH, nor a new UE behavior in case of UL LBT failure. |
| MTK | Sub topic 11-1: We support option 2, not extended. (consistent with SCell)Sup topic 11-2: We disagree with option 1. The maximum value and the corresponding UE behavior are not necessary to be specified in RAN4.  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001842 | Nokia: too many issues still open for discussion, no possible to agree with this CR. |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#11-1** | *Tentative agreements:* do not extend the time in the known cell condition in PSCell addition delay requirement*Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic#11-2** | *Tentative agreements:* *Candidate options:*A new option 3 is added below:* + Option 1: ΔPRACH is the time until successful transmission, to account for UL LBT failures. The maximum value of ΔPRACH (ΔPRACH,max) is TBD, upon exceeding which the UE can stop attempting to transmit PRACH and can abandon the PSCell addition procedure.
	+ Option 2: ΔPRACH= LRACH\*TRACH, where LRACH is the number of RACH association periods missed due to UL CCA failure and TRACH is the periodicity of RACH association period associated with the detected SS/PBCH block for PSCell addition. The maximum value for LRACH is controlled by several procedures already defined in RAN1 and/or RAN2 (e.g., T304 timer and/or exceeding the threshold for persistent UL LBT failure).
	+ Option 3: In the event of UE not being able to transmit PRACH due to UL CCA failures on this carrier: for channel access category different than channel access category 1, ΔPRACH is the total time extended to also include the time to all next PRACH retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213. For channel access category 1, ΔPRACH=0.

*Recommendations for 2nd round:* discuss the three options above. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2001842 | No need to agree on the CR in this meeting |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 11-2: support proposed agreement in the recommended WF |
| Qualcomm  | Sub topic 11-2: we agree with the recommended WF |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #12: Active TCI State Switching

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **AI** | **T-doc number** | **Company** | **Proposals / Observations** |
| 8.1.4.6 | R4-2000717 | Qualcomm Inc. | **Proposal 1**. For RRC-based active TCI state switch:1. Upon exceeding LRRC\_known\_max in known case, UE may stop active TCI state switching procedure and declare beam failure
2. Upon exceeding L1RRC\_unknown\_max or L2RRC\_unknown\_max in unknown case, UE may stop active TCI state switching procedure and declare beam failure

**Proposal 2**. RAN4 to wait for further clarification of R15 MAC-CE based active TCI state switching requirements before its specification in R16 for NR-U.**Observation 1**. R16 HARQ enhancements – non-numerical K1, enhanced dynamic codebook, and one-shot feedback – provide opportunities for HARQ retransmission resulting in potentially different timelines/delays. Moreover, per R15 HARQ procedure, a failed HARQ transmission is treated as NACK and can be scheduled for retransmission by gNB. It is overly and unnecessarily complicated for RAN4 to define extension of THARQ for all of these scenarios. The procedures are already clearly defined in TS 38.213 specification to which RAN4 requirements can simply refer. **Proposal 3**. RAN4 to not define a time limit, even a fixed one, on THARQ and rely on RAN2 procedure for persistent UL LBT failure.**Proposal 4**. RAN4 to define THARQ as:*“THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]. In the event of UL CCA failure, THARQ extends to the next HARQ feedback retransmission opportunity(ies) as specified in TS 38.213 [3].”***Proposal 5**. Definition of the parameter Tfirst-SSB should be modified in NR-U from “*time to first SSB transmission*” to “*time to first SSB instance*” to reflect the possibility of transmission failure due to CCA.  |
| R4-2000928 | MediaTek Inc. | **Observation 1**: When DL LBT fails, additional time is required for UE to synchronize with the new TCI state. In addition, for unknown TCI switch, additional time is also required for RX beam refinement.**Observation 2**: Exceeding the maximum number of DL LBT failures (i.e. L) is led by heavy loading on the unlicensed band, and staying in the old TCI would still encounter the high DL LBT failure rate.**Observation 3**: The reason for network to trigger TCI state switch should still be valid even after several LBT failures. Staying in the old TCI state will increase the probability of beam failure.**Observation 4**: The DL LBT failure is known at network. Network is able to trigger another new TCI state switch if the original TCI state switch command is considered as outdated.**Proposal 1**: For both RRC based and MAC-CE based TCI switch, UE continues the active TCI state switching with additional time when DL LBT fails till sufficient DRS samples are received or further TCI-state switch request received from network. The maximum extension is not necessary. |
|  | R4-2001559 | Huawei, HiSilicon | **Observation 1**: No new UE behavior is needed from RAN4’s perspective. The exact wording should be clarified considering the enhancement and LBT impact.**Proposal 1**: Tharq is the timing between DL data transmission and the successful transmission of acknowledgement scheduled by gNB. |
|  | R4-2001931 | Ericsson | **Proposal 1**: T1=[1280]+ L\*TSSB ms+Δ, where L (≤Lmax) is the number of measurement occasions with SSBs not available at the UE due to CCA, and Δ (≤Δmax) is the reporting delay due to UL LBT failure and UE reattempt to report at least 1 measurement for the target TCI state provided the UL resources are configured for the UE (Δ=0 for channel access category 1).**Proposal 2**: Upon exceeding Lmax (Lmax=TBD) and Δmax the UE may consider the TCI state to be unknown.**Proposal 3**: Δ UL,max is the time period from the time of the first reporting attempt failed due to UL CCA failure until the time when the UE detects consistent UL LBT failure and the corresponding RAN2 procedure is triggered [TS 38.321].**Proposal 4**: For RRC-based switching to a known state, upon exceeding LRRC,known,max the UE shall stop the active TCI state switching procedure and declares beam failure.**Proposal 5**: For MAC-CE based switching to a known state, upon exceeding LMAC,known,max the UE shall stop the active TCI state switching procedure and stay in the old state. **Proposal 6**: For switching to a known state, the extended THARQ becomes THARQ,ref+ΔHARQ, where THARQ,ref is Rel-15 THARQ with no LBT failures, and ΔHARQ≤ΔHARQ,max.**Proposal 7**: For switching to a known state, upon exceeding ΔHARQ,max, the UE shall stop attempting to transmit HARQ feedback, shall stop the active TCI state switching procedure and stay in the old state.**Proposal 8**: For RRC-based switching to an unknown state, upon exceeding L1RRC,unknown,max or L2RRC,unknown,max the UE shall abandon the active TCI state switching procedure and declare beam failure.**Proposal 9**: For MAC-CE based switching to an unknown state, upon exceeding L1MAC,unknown,max or L2MAC,unknown,max the UE shall abandon the active TCI state switching procedure and stay in the old state.**Proposal 10**: For switching to an unknown state, the extended THARQ becomes THARQ,ref+ΔHARQ, where THARQ,ref is Rel-15 THARQ with no LBT failures, and ΔHARQ≤ΔHARQ,max.**Proposal 11**: For switching to an unknown state, upon exceeding ΔHARQ,max, the UE shall stop attempting to transmit HARQ feedback, shall stop the active TCI state switching procedure and stay in the old state. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Agreement from RAN4#93:

Active TCI state switching delay (known state):

* RRC-based:
	+ LRRC,known,max =[2] for TSSB≤40 ms, LRRC,known,max =[1] for TSSB>40 ms
		- Upon exceeding LRRC,known,max the UE may stop the active TCI state switching procedure and FFS: declare beam failure
* MAC-CE based:
	+ LMAC,known,max =[2] for TSSB≤40 ms, LMAC,known,max =[1] for TSSB>40 ms
		- Upon exceeding LMAC,known,max the UE may stop the active TCI state switching procedure and FFS: stay in the old state
	+ Confirm RAN4#92-bis agreement on extending THARQ for MAC-CE based switching
		- The exact wording is TBD

Active TCI state switching delay (unknown state):

* RRC-based:
	+ L1RRC,unknown,max =[2] for TCSI-RS/SSB ≤40 ms, L1MAC,unknown,max = [1] for TCSI-RS/SSB>40 ms
	+ L2RRC,unknown,max =[2] for TSSB ≤40 ms, L2MAC,unknown,max = [1] for TSSB>40 ms
	+ Upon exceeding L1RRC,unknown,max or L2RRC,unknown,max the UE may abandon the active TCI state switching procedure and FFS: declare beam failure
* MAC-CE based switching:
	+ L1MAC,unknown,max = [2] for TCSI-RS/SSB≤40 ms, L1MAC,unknown,max = [1] for TCSI-RS/SSB>40 ms
	+ L2MAC,unknown,max =[2] for TSSB≤40 ms, L2MAC,unknown,max = [1] for TSSB>40 ms
	+ Upon exceeding L1MAC,known,max or L2MAC,known,max the UE may stop the active TCI state switching procedure and FFS: stay in the old state
	+ Confirm RAN4#92-bis agreement on extending THARQ for MAC-CE based switching
		- The exact wording is TBD

### Sub-topic 12-1

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 12-1: known state definition**

* Proposals
	+ Option 1: the time period is extended by L\*TSSB ms, where L (≤Lmax) is the number of measurement occasions with SSBs not available at the UE due to CCA.
	+ Option 2: the time period is extended by L\*TSSB ms+Δ, where L (≤Lmax) is the number of measurement occasions with SSBs not available at the UE due to CCA, and Δ (≤Δmax) is the reporting delay due to UL LBT failure and UE reattempt to report at least 1 measurement for the target TCI state provided the UL resources are configured for the UE (Δ=0 for channel access category 1).
	+ Option 3: do not extend
	+ Option 4: extend to a fixed number (>1280 ms).
* Agreements from the 1st round:
	+ Agreement: do not extend the time in the known cell condition in active TCI switching delay requirement
* Recommended WF

### Sub-topic 12-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 12-2:** **UE behaviour upon exceeding the agreed maximum L values**

Proposals

* + Option 1:
		- RRC-based: upon exceeding LRRC,known,max, UE shall stop the active TCI state switching procedure and declare beam failure; upon exceeding L1RRC,unknown,max or L2RRC,unknown,max the UE shall abandon the active TCI state switching procedure and declare beam failure.
		- MAC-CE based: upon exceeding LMAC,known,max, the UE shall stop the active TCI state switching procedure and stay in the old state; upon exceeding L1MAC,unknown,max or L2MAC,unknown,max the UE shall abandon the active TCI state switching procedure and stay in the old state.
			* NOTE: The above agreement on MAC-CE based switching can be revisited if/when the change in Rel-15 specification is agreed.
* Recommended WF
	+ Proposed agreement: option 1

### Sub-topic 12-3

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 12-3: UE behaviour related to ΔHARQ (additional time until the successful transmission of acknowledgement scheduled by gNB after UL LBT failure)**

Proposals

* + Option 1: ΔHARQ≤ΔHARQ,max, upon exceeding the limit ΔHARQ,max (controlled by RAN1 spec), the UE shall stop attempting to transmit HARQ feedback, shall stop the active TCI state switching procedure and stay in the old state.
	+ Option 2: THARQ is extended by ΔHARQ according to TS 38.213. Do not define ΔHARQ,max.
* Recommended WF
	+ Discuss the proposals
	+ Proposed agreement: THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213. In the event of UE not being able to transmit the acknowledgment due to UL CCA failures on this carrier: THARQ is extended to also include the time to all next HARQ feedback retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213; no extension of THARQ due to UL LBT failures is allowed for channel access category 1.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 12-1: support option 1Sub topic 12-2: support option 1 (for RRC, the old state is forgotten, which is not the case for MAC-CE based switching)Sub topic 12-3: support option 1 |
| Qualcomm | Sub topic 12-1: We support neither of the options and propose Option 3: do not extend the time period of known TCI state (consistent with PSCell and SCell known time periods)Sub topic 12-2: For RRC based TCI switching, we support option 1. For MAC-CE based, there are ongoing discussions in R15 and RAN4 should wait until the discussions are resolved. This is our proposal 2 in R4-2000717 which is not reflected in the above options. Sub topic 12-3: we support option 2.  |
| Huawei | Sub topic 12-2: We don’t think stay in the old TCI states is good way since the old TCI state is more likely to be in bad conditions.Sub topic 12-3: Support Option 2. |
| Apple | Sub topic 12-1: we support Qualcomm comment and propose to not extend. The reason is same as we gave for Scell activation.Sub topic 12-3: we support option 2. |
| Nokia | Sub-topic 12-1: we support Option 1. Sub-topic 12-2: Not possible to agree with option 1. There are still ongoing discussions about MAC-CE based TCI state switch.Sub-topic 12-3: we support Option 2. |
| MTK | Sub topic 12-1: we do not agree option 1 nor 2. And we support option 3, proposed by Qualcomm. Extension depends on LBT failures is not acceptable, since it will require UE to check the presence of every SSB during this time period.Sub topic 12-2: we disagree with option 1. For RRC based TCI switch, new UE behaviour should not be introduced to declare beam failure, because it will have impact on RAN1/RAN2 specification. Beam failure detection is a separate procedure and the beam failure can be declare correspondingly, it should not introduce new triggering condition for beam failure detection. For MAC based TCI switch, the old TCI is likely to be in bad conditions. Our proposal is that UE continues the active TCI state switching, and the maximum extension is not necessary (Proposal 1 in R4-2000928, which is not captured in the above options). UE should be allowed to finish the TCI switch with additional time when DL LBT fails till sufficient DRS samples are received or further TCI-state switch request received from network. Moderator: The above proposals are not aligned with the earlier RAN4 agreements where we agreed to specify the maximum L values and the corresponding UE behavior.Sub topic 12-3: we support option 2, not to define a time limit on T\_HARQ, since it should be consistent with RAN1 specification. |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#12-1** | *Tentative agreements:* do not extend the time in the known cell condition in active TCI switching delay requirement*Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic#12-2** | *Tentative agreements:* * RRC-based: upon exceeding LRRC,known,max, UE shall stop the active TCI state switching procedure and declare beam failure; upon exceeding L1RRC,unknown,max or L2RRC,unknown,max the UE shall abandon the active TCI state switching procedure and declare beam failure.
* MAC-CE based: upon exceeding LMAC,known,max, the UE shall stop the active TCI state switching procedure and stay in the old state; upon exceeding L1MAC,unknown,max or L2MAC,unknown,max the UE shall abandon the active TCI state switching procedure and stay in the old state.
* NOTE: The above agreement on MAC-CE based switching can be revisited if/when the change in Rel-15 specification is agreed.

*Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic#12-3** | *Tentative agreements:* THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213. In the event of UE not being able to transmit the acknowledgment due to UL CCA failures on this carrier: for channel access category different than channel access category 1, THARQ is extended to also include the time to all next HARQ feedback retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213. No extension of THARQ due to UL LBT failures is allowed for channel access category 1.*Candidate options:**Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 12-2: support proposed agreement in the recommended WFSub topic 12-3: support proposed agreement in the recommended WF |
| Qualcomm | Sub topic 12-2: we can agree to recommended WFSub topic 12-3: same comments as in sub topic 10-2. |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |