**3GPP TSG-RAN WG4 Meeting # 95-e R4-2009039**

**Electronic Meeting, 25 May – 5 June, 2020**

**Agenda item:** 6.17.1

**Source:** Moderator (CMCC)

**Title:** Email discussion summary for [95e][227] NR\_HST\_RRM

**Document for:** Information

# Introduction

This email discussion focuses on RRM for Rel-16 NR HST, and in particular the agenda items:

6.17.1 RRM core requirements

6.17.1.1 Cell re-selection

6.17.1.2 Cell identification delay

6.17.1.3 RLM

6.17.1.4 Beam management

6.17.1.5 Inter-RAT measurement

The targets of email discussion for 1st round and 2nd round are:

* 1st round: discuss the open issues and strive to minimize the open issues. Companies are encouraged to provide comments on the open issues and CRs
* 2nd round: according to 1st round discussion, discuss left open issues for 2nd round, and strive to minimize the open issues. Strive to agree on CRs

# Topic #1: Cell re-selection requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2006719**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006719.zip) | Qualcomm, Inc. | Observation 1: With relaxation factor M2 = 1.5 and M3 = 2, measurement requirement in DRx=0.32s is still sufficient for NR HST application scenarios.Observation 2: Connectivity might be affected in the worst-case scenario with 500km/h and ISD = 700m when M = 1.5. However, if ISD is larger than 700m or speed is slower than 500km/h, M=1.5 is a feasible configuration to maintain the connectivity.Proposal 1: Support operators view on whether to add a note for relaxation factor. Observation 3: Frequency offset considered in HST has significant impact on SINR measurement, especially in high SNR region.Proposal 2: SINR accuracy requirement is not applicable to HST scenario when SNR > 5dB.Proposal 3: Inter-RAT cell identification for LTE in NR SA requirement is specified by

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | TdetectEUTRA\_FDD [s] (number of DRX cycles) | TmeasureEUTRA\_FDD [s] (number of DRX cycles) | TevaluateEUTRA\_FDD[s] (number of DRX cycles) |
| 0.32 | 4.16 (13) | 0.96 (3) | 1.6 (5) |
| 0.64 | 8.32 (13) |  1.92 (3) | 3.2 (5) |
| 1.28 | 12.8 (10) | 2.56 (2) | 6.4 (5) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Proposal 4: Inter-RAT cell identification for LTE in NR SA requirement is specified by

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|  | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<0.32 | Note1 (15) | Note1 (15) |
| 0.32<= DRx cycle <= 0.64 | Note1 (10) | Note1 (10) |
| 0.64 < DRx cycle <= 1.28 | Note1 (8) | Note1 (8) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20) | Note1 (20) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: The requirement only applicable to CSSFinterRAT = 1 case, otherwise number of DRx cycles should be scaled by CSSFinterRAT |

Proposal 5: Inter-RAT cell identification for LTE in NR SA requirement is specified by:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR [s] (number of DRX cycles) | Tmeasure,NR [s] (number of DRX cycles) | Tevaluate,NR[s] (number of DRX cycles) |  |
|  |
| 0.32 | 5.12 (16 x M) | 0.96xM (3 x M) | 1.6xM (5 x M) |   |
| 0.64 | 10.24 (16) |  1.92 (3) | 3.2 (5) |   |
| 1.28 | 16.64 (13) | 2.56 (2) | 6.4 (5) |   |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68(3) |   |
| Note 1: M = 1.5 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M=1. |  |

Proposal 6: Cell re-selection requirements on EUTRA-NR inter-RAT in idle mode follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_intra | T SSB\_measurement\_period\_intra   | TSSB\_time\_index\_intra |
| No DRX | max[600ms, [8] x max(MGRP, SMTC period)] × Nfreq | Max(200ms, 8 × Max(MGRP, SMTC period)) × Nfreq | max[120ms, [3] x max(MGRP, SMTC period)] × Nfreq |
| DRX cycle ≤ 320ms | max[600ms, ceil([8]xM) x max(MGRP, SMTC period, DRX cycle)] × Nfreq | Max(200ms, Ceil(8 × M) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq | max[120ms, ceil([3] x M) x max(MGRP, SMTC period, DRX cycle)] × Nfreq |
| DRX cycle > 320ms | 4xM x DRX cycle × Nfreq | 4xM × DRX cycle × Nfreq | [3] x DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When SMTC < =40ms, M=1; when SMTC >40ms, M = 1.5 |

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| [**R4-2006770**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006770.zip) | CMCC | Proposal 1: it is not preferred to introduce additional note in the spec, such as Note x: Operation with scaling factor M=1.5, M=2 may not be sufficient in all high speed train deployments considered in this release of the specifications should be added in NR high speed specifications.Proposal 2: Rel.16 HST RRM enhanced requirement are proposed to be release independent from Rel-15. |
| [**R4-2006774**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006774.zip) | CMCC | 38.133 CR on cell re-selection requirements for Rel-16 NR HST |
| [**R4-2006965**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006965.zip) | CMCC | LS on supporting Rel-16 NR HST RRM enhanced requirements from Rel-15 UEs |
| [**R4-2007162**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007162.zip) | Nokia, Nokia Shanghai Bell | Observation 1: Serving cell measurements are more relaxed than intra-frequency neighbour cell measurements for SMTC=40ms.Related to this we propose:Proposal 1: For HST M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.64 second for the serving cell measurements.Proposal 2: For HST M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.32 second for the serving cell measurements.Proposal 3: Include a note for NR HST when at least NR HST mobility can be ensured with the existing measurement assumptions. |
| [**R4-2007272**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007272.zip) | vivo | Proposal 1 Not to align serving cell and neighbour cell requirement for intra-frequency cell re-selection in NR HST.Proposal 2 If the alignment needs to be done, Table II is acceptable as a compromise. Table II. Compromised proposal for cell re-selection requirements for NR HST

|  |  |  |  |
| --- | --- | --- | --- |
| 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 | [2.56 x M2 (8 x M2)] | [0.64 x M3 (2 x M3)] | [0.96 x M4 (3 x M4)] |
| 0.64 | [5.12 (8)] | [1.28 (2)] | [1.92 (3)] |
| 1.28 | [8.96 (7)] | [1.28 (1)] | [3.84 (3)] |
| 2.56 | [58.88 (23)] | [2.56 (1)] | [7.68 (3)] |
| Note 1: when SMTC < =40ms, M2=M3=M4=1; when SMTC >40ms, M2 = M3 =1.5, M4 = 2 |

Proposal 3 No note is added to the HST requirements in TS 38.133.Observation 1 Due to high Doppler shift in HST scenario, ICI exists, and its impact is on both serving cell and neighbour cell SS-SINR accuracy.Proposal 4 For SS-SINR requirement in HST, adopt option 1, i.e. SINR accuracy requirement is not applicable to HST scenario in R16. The issue can be left to R17.Proposal 5 On NR-EUTRAN inter-RAT cell identification requirement in connected mode, slightly prefer option 1, i.e. adopt Table III. Table III Proposed NR-EUTRAN inter-RAT cell identification requirement in connected mode

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<0.32 | Note1 (15) | Note1 (15) |
| 0.32<= DRx cycle <= 1.28 | Note1 (10) | Note1 (10) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20) | Note1 (20) |
| NOTE 1: The time depends on the DRX cycle length. |

Proposal 6 On NR-EUTRAN inter-RAT cell measurement requirement in connected mode, R15 NR requirement can be reused for NR HST.Proposal 7 On EUTRAN-NR inter-RAT requirement in connected mode, adopt Table IV.Table IV. Proposed requirement for EUTRAN-NR inter-RAT requirement in connected mode

|  |  |  |  |
| --- | --- | --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_intra | T SSB\_measurement\_period\_intra   | TSSB\_time\_index\_intra |
| No DRX | max[600ms, 8 × max(MGRP, SMTC period)] × Nfreq | Max(200ms, 8 × Max(MGRP, SMTC period)) × Nfreq | max[120ms, 3 × max(MGRP, SMTC period)] × Nfreq |
| DRX cycle < 320ms | max[600ms, ceil(8 × M) × max(MGRP, SMTC period, DRX cycle)] × Nfreq | Max(200ms, Ceil(8 × M) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq | max[120ms, ceil(3 × M) × max(MGRP, SMTC period, DRX cycle)] × Nfreq |
| DRX cycle ≥ 320ms | 8 × M × DRX cycle × Nfreq | 6 × M × DRX cycle × Nfreq | 3 × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When SMTC < =40ms, M=1; when SMTC >40ms, M = 1.5 |

Proposal 8 On NR-EUTRAN inter-RAT cell reselection requirement, adopt option 2 or 3 in last meeting’s WF.Proposal 9 On EUTRAN-NR inter-RAT cell re-selection requirements, adopt Table V.Table V Proposed requirement for EUTRAN-NR inter-RAT cell reselection requirement

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR [s] (number of DRX cycles) | Tmeasure,NR [s] (number of DRX cycles) | Tevaluate,NR [s] (number of DRX cycles) |
|  |
| 0.32 | 5.12 x M1 (16 x M1) | 0.64 x M1 (2 x M1 ) | 0.96 x M2 (3 x M2) |  |
| 0.64 | 7.68 (12) | 1.28 (2 ) | 1.92(3) |  |
| 1.28 | 12.8 (10) | 1.28 (1 ) | 6.4(3) |  |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68(3) |  |
| Note 1: M1 = 1.5 and M2 = 2 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M1=M2=1. |  |

Proposal 10 NR HST RRM features should be ‘mandatory with capability signaling’, and no early implementation for HST RRM features is preferred. |
| [**R4-2008040**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008040.zip) | Nokia Corporation | CR for Measurement and evaluation of serving cell in HST |

## 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: Additional note in the spec for cell re-selection requirements in idle mode

**Background:**

* For cell re-selection requirements for neighbor cell, when SMTC < =40ms, remove M2, M3, M4; when SMTC >40ms, M2 = 1.5, M3 = M4 = 2
	+ FFS whether additional note such as Note x: Operation with scaling factor M=1.5, M=2 may not be sufficient in all high speed deployments considered in this release of the specifications should be added in NR high speed specifications

**Issue 1-1: for cell re-selection requirements, whether additional note should be added to the spec, such as Note x: Operation with scaling factor M=1.5, M=2 may not be sufficient in all high speed deployments considered in this release of the specifications.**

* Proposals
	+ Option 1 (Nokia, Ericsson): Yes
	+ Option 2 (CMCC, vivo, QC, HW): No
* Recommended WF
	+ 6 companies discuss issue 1-1, 4 companies prefer not to add the additional note, 2 companies suggest to add the note.
	+ Different operators have different deployment for high speed train scenario, e.g. ISD, velocity. That’s why from Rel-14 LTE HST to now, when we discuss the RRM enhancement requirements for HST, general requirements are expected target for general scenarios. Network has the knowledge of network deployment, then network can configure corresponding parameters to adapt different scenarios. Taking above consideration into account, Moderator would like to check whether following option 2 can be acceptable:
* No need to add additional note in the spec

### Sub-topic 1-2: Cell re-selection requirements for serving cell

**Background:**

In current requirements, Table 4.2.2.2-1 in TS 38.133 lists the measurement requirements for the serving cell as following table:

|  |  |  |
| --- | --- | --- |
| **DRX cycle length [s]** | **Scaling Factor (N1)** | **Nserv [number of DRX cycles]** |
| **FR1** | **FR2Note1** |
| 0.32 | 1 | 8 | M1\*N1\*4 |
| 0.64 | 5 | M1\*N1\*4 |
| 1.28 | 4 | N1\*2 |
| 2.56 | 3 | N1\*2 |
| Note 1: Applies for UE supporting power class 2&3&4. For UE supporting power class 1, N1 = 8 for all DRX cycle length. |

For the M1 RAN4 has defined followed:

M1=2 if SMTC periodicity (TSMTC) > 20 ms and DRX cycle ≤ 0.64 second

In the last meeting, it was agreed that the scaling factor is 1.5 or 2 when SMTC periodicity (TSMTC) > 40 ms for the cell re-selection requirements of neighbour cell.

**Issue 1-2: whether need to align the serving cell measurement requirements with the agreement for intra-frequency neighbour cell measurement, ie, M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.32 second**

* Proposals
	+ Option 1 (Nokia): for the measurement requirements for serving cell, M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.32 second
* Recommended WF
	+ More discussion is needed.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Sub topic 1-1: option 2 is acceptable.In LTE R13 HST SI phase, multiple HST scenarios were provided by operators. Large ISD in rural and the SFN scenarios with large RRH distance are typical HST scenarios. The requirements for NR HST shall be general. Network has knowledge of network deployment and has the capability to configure proper parameters.Sub topic 1-2: No need to align.In R15, we discussed how to determine the threshold of SMTC for serving cell measurement. The rational of introducing 20ms SMTC is depicted in [R4-1810779]. Firstly because 20 ms SMTC periodicity ensures frequent availability of SSBs (for measurements, AGC etc) compared to larger SMTC periodicities. Secondly 20 ms SMTC periodicity is the default value used for initial cell selection etc.If we changed 20ms to 40ms, the above reasons are invalid.  |
| Ericsson | Subtopic 1-1 : In our understanding the main difference between LTE and NR is that in LTE all enhanced requirements were targeted to meeting the full objectives of the WI such as 350km/h for rel14 and 500km/h for rel16, and cases where this was not feasible were not updated, such as 2.56s DRX cycle in idle reselections. That situation still exists in NR (eg 2.56s DRX is not suitable for high speed), however there is an additional category of requirement which is partially enhanced but has not been agreed to fully meet the WID objectives such as 80ms or 160ms SMTC period with 1.5x scaling. We do not disagree with the topic leader’s view that network has the knowledge of the actual deployment and needs to be configured correctly for different scanarios,, in fact it is for exactly this reason that we see it is beneficial to identify the requirements which I have described as “partially enhanced”. Otherwise we have the situation that the analysis that RAN4 has already completed has to be repeated again to see if some enhanced parameter set is actually suitable. While I can accept that 38.133 is not intended to be a cook book giving the recipe for setting NW parameters, nevertheless I see no particular benefit to not clarifying which parameters and requirements may need to be specially looked at in a particularly demanding deployment or scenario. So I do not agree and think the note would be beneficial. We can consider any other wording, and we could for example be quite specific such as “requirement may not be sufficient for operation at 500km/h with 700m ISD” (or any other words which would allow us to identify such requirements).Subtopic 1-2 : We think option 1 is needed, since reselections are often based on ranking of neighbour vs serving cell, and if the serving cell evaluation is done more slowly with M=2, it may become the bottleneck.Others : In many CRs for HST (not just idle mode) including Ericsson CRs there is a parameter like “TBD\_HSTflag. It is not possible to use TBD in 38.133 due to ITU submission. So my suggestion is to use some generic phrase like “if RRM enhancements for high speed are configured.” Or something like that, which avoids the need for TBD without knowing the exact RAN2 IE name. If needed, it would be OK to replace this later with the exact flag name when we know it (we would have needed to update the TBD anyway. |
| vivo | **Issue 1-1: for cell re-selection requirements, whether additional note should be added to the spec, such as Note x: Operation with scaling factor M=1.5, M=2 may not be sufficient in all high speed deployments considered in this release of the specifications.**We prefer option 2. For RRM requirement, it is RAN4 common understanding that the requirement is not sufficient for all possible deployment. This has been done for several releases.If companies are not fine with it, one compromised proposal is to capture such not as RAN4 common understanding in a WF. However, it is not suggested to make such note in the spec, since this is never done in previous release.**Issue 1-2: whether need to align the serving cell measurement requirements with the agreement for intra-frequency neighbour cell measurement, ie, M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.32 second**We prefer not to align the requirement for SMTC = 40ms. The mobility performance is not as good as 20ms for non-HST scenario and therefore we don’t think RAN4 has strong motivation to enhance it to HST scenario.If alignment need to be done, for the issue that UE need to measure neighbour cells more frequently than serving cell when DRX=320ms or 640ms, it is suggested to relax intra frequency re-selection requirement. Since the table was agreed in RAN4#93 with square bracket, and if RAN4 agrees to deal with this issue, we think it can be revised and agreed in this meeting.

|  |  |  |  |
| --- | --- | --- | --- |
| **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 | [2.56 x M2 (8 x M2)] | [0.64 x M3 (2 x M3)] | [0.96 x M4 (3 x M4)] |
| 0.64 | [5.12 (8)] | [1.28 (2)] | [1.92 (3)] |
| 1.28 | [8.96 (7)] | [1.28 (1)] | [3.84 (3)] |
| 2.56 | [58.88 (23)] | [2.56 (1)] | [7.68 (3)] |
| Note 1: when SMTC < =40ms, M2=M3=M4=1; when SMTC >40ms, M2 = M3 =1.5, M4 = 2 |

 |
| CATT | **Issue 1-1: Support option 2****Issue 1-2: No need to align** |
| MTK | Sub topic 1-1: Support Option 1.From our observation, no company is denying that fact that the enhanced performance may not be sufficient in all high speed deployments. It is only about the issue of whether and how to capture it in spec. Technically, we do not think the note is mis-leading.Sub topic 1-2: Support Option 2.In IDLE mode, UE already needs to perform serving cell measurement and neighboring cell measurement with different frequency (delay requirements). Aligning the condition here for Nserv does not change this fact.  |
| CMCC | **Issue 1-1: support option 2. We are not OK to add the note in the spec, the note will introduce confusion to the spec. Firstly, we do not see the necessity of adding this note to the spec. The target velocity of this WID is up to 500km/h, not limited to only 500km/h. What’s more, the ISD is related to operators’ deployment, different operators have different deployment. The RRM enhancement for HST are general requirements. It is not necessary to add the note to the spec. Secondly, considering the scenario is affected by ISD, velocity, etc, from our point of view, it is difficult to enumerate which scenarios are OK and which scenarios are not OK to be applied with the enhanced requirements. We are not OK with the alternative wording suggested by Ericsson “requirement may not be sufficient for operation at 500km/h with 700m ISD”, with this wording, could we assume that other scenarios, e.g. 500km/h + 800m ISD or 450km/h with 1000m, are suitable for the requirements? We do not think so. As we mentioned it is difficult to enumerate all the scenarios. In order to avoid introducing confusion to the spec, we do not prefer to add the note.****Issue 1-2: no need to align. There are two reasons. Firstly, after checking the previous discussion in Rel-15, it is found that the reason to introduce the scaling factor for neighbour cell and serving cell are different. For neighbour cell, as mentioned by companies in previous discussion, the scaling factor is used to solve the misalignment between DRX on-duration and SMTC. However, for serving cell, as analyzed in R4-1808830/R4-1809328, the main reason to introduce the scaling factor is to solve the collision between paging occasion and SSB. Secondly, the misalignment already exists in Rel-15. In Rel-15, for neighbour cell, the scaling factor exists for DRX=0.32s, while for serving cell, the scaling factor exists for DRX <=0.64s. It seems that no issues are observed with this misalignment in Rel-15.** |
| Nokia, Nokia Shanghai Bell | Sub-topic 1-1: From the discussions it is clear that not all parameter settings can be used on network if it is expected that UE does not drop from service. Different from the LTE case is that in NR there is no continuous SSS/PSS and CRS available but only periodic SSBs. Hence, in HST scenario using long SMTC periods (which leads to a 1.5x scaling in addition) will increase the risk of UEs dropping from service. We do agree that network should have knowledge about the deployment and expected speed used and should use appropriate settings ensuring UE connectivity. Our view though, is that having a clarifying note stating that RAN4 does not expect that timely mobility can be ensured at highest supported speed (i.e. 500kmh) if long SMTC period and scaling is in use, would be helpful.Sub-topic 1-2: We see this update is necessary. Without the update, if SMTC on serving carrier is 40ms it would lead to that the UE will evaluate the serving cell using 8 consecutive DRX cycles (e.g. 8\*320ms). Hence, the time it takes for the UE to detect that the serving cell does not fulfil the cell selection criterion S is increased. Additionally, it will delay the serving cell evaluation is slower which may cause reselection failures. |
| QC | Sub-topic 1-1: support option 2As we mentioned in our contribution, even with relaxation factor of M=1.5, DRx = 320ms measurement is faster than DRx=640ms. Therefore, we don’t think the note is needed for cell reselection requirement. [topic 2-1]: support operator’s view on thisHowever, we agree that with relaxation factor, the cell identification requirement might be slow for ISD = 700m and speed = 500km/h, and want to emphasize that re-selection doesn’t have measurement being too slow due to relaxation factor issue. Our understanding on this issue is that allowing longer SMTC with M=1.5 is mainly to provide flexibility for operator deployment in HST scenarios. Therefore, we inclined to support operator’s view on this issue.Sub-topic 1-2: no enhancement is needed for serving cell measurementThe “neighbour cell measurement faster than serving cell” issue exists already in non-HST. Take DRx cycle = 0.64, SMTC = 20ms as example, serving is 8 DRx cycles, while neighbour is 2 DRx cycle. If in non-HST this is not an issue, in HST we don’t have to align serving to neighbour cell measurement. |

### 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** |
| [**R4-2006774**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006774.zip) | Company A |
| Company B |
| Nokia, Nokia Shanghai Bell: The CR seems in general fine, but for table 4.2.2.3-2 it would be clearer if it states that it applies to FR1. Table 4.2.2.3-1 applies to FR1 and FR2. |
| [**R4-2008040**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008040.zip) | MTK: we do not think this CR is needed. |
| Company B |
| QC: pending agreement for 1-2 |

## 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 #1: Additional note in the spec for cell re-selection requirements in idle mode s** | **Issue 1-1: for cell re-selection requirements, whether additional note should be added to the spec, such as Note x: Operation with scaling factor M=1.5, M=2 may not be sufficient in all high speed deployments considered in this release of the specifications.*** Option 1 (Nokia, Ericsson, MTK,): Yes
* Option 2 (CMCC, vivo, QC, HW, CATT): No

8 companies discuss this issue. 5 companies prefer option 2. 3 companies prefer option 1. ***Recommendations for 2nd round:******Companies prefer option 1 think that there are some scenarios that the requirements may not be sufficient. Companies prefer option 2 think that it is necessary to avoid introducing confusion to the spec. Since the scenarios are related with velocity, ISD, etc. It is difficult to find the exact wording to enumerate all the applicable scenarios. Without the exact wording, the note will introduce confusion to the spec.*** ***Considering that this meeting is the last meeting for core part completion, to move forward, moderator would like to check with companies whether following suggestion is acceptable:******Instead of adding the note in the spec, the note is captured in the WF. And companies are suggested to improve the wording of the note during the 2nd round discussion.*** |
| **Sub-topic 1-2: Cell re-selection requirements for serving cell** | **Issue 1-2: whether need to align the serving cell measurement requirements with the agreement for intra-frequency neighbour cell measurement, ie, M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.32 second*** Option 1 (Nokia, Ericsson): for the measurement requirements for serving cell, M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.32 second
* Option 2 (HW, vivo, CATT, MTK, CMCC, QC): no need to align

8 companies discuss this issue. 6 companies prefer option 2. 2 companies prefer option 1. ***Recommendations for 2nd round:******Further discussion in the 2nd round. Since this meeting is the last meeting for core part completion, companies are encouraged to provide compromise to move forward.*** |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on RRM requirements for NR HST A single WF will be used to cover all the topics, as previous meeting’s way of working | CMCC |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| [**R4-2006774**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006774.zip) | *to be revised* |

## Discussion on 2nd round (if applicable)

### Open issues for 2nd round

**Issue 1-1: for cell re-selection requirements, whether additional note should be added to the spec, such as Note x: Operation with scaling factor M=1.5, M=2 may not be sufficient in all high speed deployments considered in this release of the specifications.**

* Proposals
	+ Option 1: Yes
	+ Option 2: No
* Recommended WF for 2nd round
* According to the 1st round discussion, Companies supporting option 1 think that there are some scenarios that the requirements may not be sufficient. Companies supporting option 2 think that it is necessary to avoid introducing confusion to the spec. Since the scenarios are related with velocity, ISD, etc. It is difficult to find the exact wording to enumerate all the applicable scenarios. Without the exact wording, the note will introduce confusion to the spec. Considering that this meeting is the last meeting for core part completion, to move forward, moderator would like to check with companies whether following suggestion is acceptable:
	+ Instead of adding the note in the spec, the note is captured in the WF. And companies are suggested to improve the wording of the note during the 2nd round discussion.

**Issue 1-2: whether need to align the serving cell measurement requirements with the agreement for intra-frequency neighbour cell measurement, ie, M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.32 second**

* Proposals
	+ Option 1: for the measurement requirements for serving cell, M1=2 if SMTC periodicity (TSMTC) > 40 ms and DRX cycle ≤ 0.32 second
	+ Option 2: no need to align
* Recommended WF for 2nd round
* As mentioned by some companies that the misalignment between serving cell and neighbour cell is already existing in Rel-15, moderator would like to check with companies whether option 2 is acceptable for companies.

### Companies views’ collection for 2nd round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Issue 1-1: agree with the recommended WF.Issue 1-2: support option 2. |
| QC | Issue 1-1: agree with the recommended WF.Issue 1-2: support option 2. |
| Nokia | Issue 1-1:To progress the work and accounting the majority view, we can compromise to follow legacy approach. It would be good to capture the wording in a WF.Issue 1-2:To us this misalignment is very unfortunate. But to progress we can go forward and leave the misalignment. |
| CMCC | Issue 1-1: agree with the recommended WFIssue 1-2: option 2 |
| vivo | Issue 1-1: agree with the recommended WF.Issue 1-2: support option 2. |
| Ericsson | Issue 1-1 : OK, we can follow the recommended WF. From our purposes the main reason for triggering this discussion was to try to capture this discussion so that BS or UE designers not in RAN4 would be aware to be more careful about using certain enahnced configurations. Since they are not going to look at the WF, we do not think it is worth spending too much time on refinement of the wording for this part of the WF. We propose**Delays with scaling factor M=1.5, M=2 may not be sufficient in all high speed deployments considered in this work item****Delays with DRX = 1.28s or 640s may not be sufficient in all high speed deployments considered in this work item**Issue 1-2 : We preferred option 1 as option 2 may force 20ms SMTC to be used in some cases but can agree option 2 to conclude the work. |
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### CRs/TPs comments collection for 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revised [**R4-2006774**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006774.zip)(R4-2008628) | QC: missing “ms” after 40 |
| CMCC: to QC, thanks for the comments, the CR will be revised by updating 40 to 40ms |
|  |
| [**R4-2008040**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008040.zip) |  |
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## 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**  |
| R4-2008628 | *This CR is agreeable* |
| [R4-2008040](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008040.zip) | *Based on the 2nd discussion, it is agreed that there is no need to align the serving cell measurement requirements with the proposal for intra-frequency neighbour cell measurement. Based on the agreements, this CR is not needed and can be noted.* |
| R4-2008627 | *This WF is agreeable* |

# Topic #2: Cell identification delay requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2006231**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006231.zip) | CATT | CR on cell identification requirements for NR HST |
| [**R4-2006983**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006983.zip) | Ericsson | Proposal 1 A note such as Note x : Operation with scaling factor M=1.5, M=2 may not be sufficient in all high speed deployments considered in this release of the specifications should be added in NR high speed specifications. |
| [**R4-2007163**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007163.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: RAN4 includes a note addressing the use of long DRX cycles in HST scenario.Proposal 2: Add a note that in HST the UE can be assumed to perform more than measurement per DRX cycle. |
| [**R4-2008090**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008090.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: If RAN4 decides to specify SS-SINR accuracy requirements for HST, then reusing the Rel-15 intra-frequency SS-SINR accuracy requirements that apply to [-3] dB ≤ SNR ≤ [7] dB. |
| [**R4-2006719**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006719.zip) | Qualcomm, Inc. | Observation 1: With relaxation factor M2 = 1.5 and M3 = 2, measurement requirement in DRx=0.32s is still sufficient for NR HST application scenarios.Observation 2: Connectivity might be affected in the worst-case scenario with 500km/h and ISD = 700m when M = 1.5. However, if ISD is larger than 700m or speed is slower than 500km/h, M=1.5 is a feasible configuration to maintain the connectivity.Proposal 1: Support operators view on whether to add a note for relaxation factor. Observation 3: Frequency offset considered in HST has significant impact on SINR measurement, especially in high SNR region.Proposal 2: SINR accuracy requirement is not applicable to HST scenario when SNR > 5dB. |
| [**R4-2006770**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006770.zip) | CMCC | Proposal 1: it is not preferred to introduce additional note in the spec, such as Note x: Operation with scaling factor M=1.5, M=2 may not be sufficient in all high speed train deployments considered in this release of the specifications should be added in NR high speed specifications.Proposal 2: Rel.16 HST RRM enhanced requirement are proposed to be release independent from Rel-15. |
| [**R4-2007272**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007272.zip) | vivo | Proposal 3 No note is added to the HST requirements in TS 38.133.Observation 1 Due to high Doppler shift in HST scenario, ICI exists, and its impact is on both serving cell and neighbour cell SS-SINR accuracy.Proposal 4 For SS-SINR requirement in HST, adopt option 1, i.e. SINR accuracy requirement is not applicable to HST scenario in R16. The issue can be left to R17. |
| [**R4-2006772**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006772.zip) | CMCC | Proposal 1: it is proposed to specify SS-SINR requirements. Proposal 2: For HST scenario, specify SS-SINR accuracy requirement for SNR <= [11] dB. |

## 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: Addtional note in the spec for cell identification requirements in the connected mode

**Background:**

* For cell identification requirements in connected mode
	+ In connected mode, when SMTC < =40ms, remove 1.5x scaling factor; when SMTC > 40ms, keep the scaling factor.
		- FFS whether additional note such as Note x: Operation with scaling factor 1.5 may not be sufficient in all high speed deployments considered in this release of the specifications should be added in NR high speed specifications
* Measurement delay in connected mode:
	+ For DRX <=160ms
		- 5 DRX cycles
		- when SMTC < =40ms, remove 1.5x scaling factor; when SMTC > 40ms, keep the scaling factor
	+ For 160ms < DRX<=320ms
		- 4 DRX cycles
		- when SMTC < =40ms, remove 1.5x scaling factor; when SMTC > 40ms, keep the scaling factor
	+ For DRX > 320ms
		- 3 DRX cycles when SMTC <= 40ms, 5 DRX cycles when SMTC > 40ms

**Issue 2-1: for cell identification requirements, whether additional note should be added in the specifications, such as Note x: Operation with scaling factor 1.5 may not be sufficient in all high speed deployments considered in this release of the specifications**

* Proposals
	+ Option 1 (Ericsson, Nokia): Yes
	+ Option 2(CMCC, vivo, QC, HW): No
* Recommended WF
	+ Issue 2-1 is similar as Issue 1-1, Moderator suggests companies focus on the discussion of Issue 1-1.

### Sub-topic 2-2: Applied DRX cycle in connected mode for HST

**Background:**

* For NR HST in connected mode, enhanced requirements are applied for DRX cycle <= 1.28s
	+ FFS whether additional note is added to the spec, such as “Requirements with 0.64s and 1.28s DRX cycle may not be sufficient in all high speed deployments considered in this release of the specifications” should be added in NR high speed specifications”

**Issue 2-2: whether additional note is added to the spec, such as “Requirements with 0.64s and 1.28s DRX cycle may not be sufficient in all high speed deployments considered in this release of the specifications” should be added in NR high speed specifications”**

* Proposals
	+ Option 1 (Nokia): Yes, add a note that in HST the UE can be assumed to perform more than measurement per DRX cycle
	+ Option 2 (CMCC, vivo, QC): No
* Recommended WF
	+ More discussion is needed.

### Sub-topic 2-3: SS-SINR

**Issue 2-3: SS-SINR**

* Proposals
	+ Option 1 (CMCC): Specify SS-SINR accuracy requirement for SNR <= [11] dB
	+ Option 2 (QC): SINR accuracy requirement is not applicable to HST scenario when SNR > 5dB
	+ Option 3 (vivo): SINR accuracy requirement is not applicable to HST scenario in R16. The issue can be left to R17.
	+ Option 4 (Nokia): If RAN4 decides to specify SS-SINR accuracy requirements for HST, then reusing the Rel-15 intra-frequency SS-SINR accuracy requirements that apply to [-3] dB ≤ SNR ≤ [7] dB.
* Recommended WF
	+ More discussion is needed.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Sub topic 2-1: agree with the recommended WF.Sub topic 2-2: support Option 2. This is alike the note for 1.5 scaling factor. It is left to network configuration and without specification impact.Sub topic 2-3: option 3 or option 4 is ok. |
| Ericsson | Subtopic 2-1 Same view as subtopic 1-1Subtopic 2-2 : DRX related note is needed for the same reason as SMTC related note in 2-1Subtopic 2-3 : OK for options 1,3 or 4. |
| vivo | **Issue 2-1: for cell identification requirements, whether additional note should be added in the specifications, such as Note x: Operation with scaling factor 1.5 may not be sufficient in all high speed deployments considered in this release of the specifications**We prefer option 2. Similar reason for Issue 1-1.**Issue 2-2: whether additional note is added to the spec, such as “Requirements with 0.64s and 1.28s DRX cycle may not be sufficient in all high speed deployments considered in this release of the specifications” should be added in NR high speed specifications”**We prefer option 2. Of course 1.28 DRX cycle is not applicable for all scenarios and this should be RAN4 common understanding for several release. For HST connected state requirement, network may configure C-DRX parameters based on UE speed and we see the requirement is still applicable for some cases.**Issue 2-3: SS-SINR** We prefer option 3. As discussed in our paper, due to high Doppler shift in HST scenario, ICI exists, and its impact is on both serving cell and neighbour cell SS-SINR accuracy. Having requirement with one upper bound may not be a good choice due to 1. Whether test case can be set for this case is questionable.
2. SS-SINR itself is useless.

Moreover, we see CSI-SINR is better for HST scenario. Therefore we suggest that SS-SINR is not applicable in R16 and further discuss CSI-SINR in R17. |
| CATT | Issue 2-1: Same view as issue 1-1Issue 2-2: support option 2 |
| MTK | Issue 2-1: same view as Issue 1-1Issue2-3: Support Option 3.SS-SINR is suffering the consistent interference from the SSB of interfering cells. That means a low reported value for SS-SINR is highly likely under-estimating the real channel condition of UE, which makes it not a good metric under low SINR condition. Now SS-SINR suffers additional ICI at mid-to-high SINR region. More discussions for the use case is needed. |
| CMCC | **Issue 2-1: option 2, same comments as in Issue 1-1****Issue 2-2: option 2** |
| Nokia, Nokia Shanghai Bell | Sub-topic 2-1: Issue 2-1: for cell identification requirements, whether additional note should be added in the specifications, such as Note x: Operation with scaling factor 1.5 may not be sufficient in all high speed deployments considered in this release of the specificationsSame view as in Sub-topic 1-1. As this is connected mode, we see it even more beneficial to have such clarificationSub-topic 2-2: Issue 2-2: whether additional note is added to the spec, such as “Requirements with 0.64s and 1.28s DRX cycle may not be sufficient in all high speed deployments considered in this release of the specifications” should be added in NR high speed specifications”The note related to DRX is needed based on same reason that for the highest velocities we do not see it technically feasible to ensure mobility with longest DRX cycles. It is only feasible at lower speed.Sub-topic 2-3: Issue 2-3: SS-SINRIn general, there is no major difference between Options 1, 2 and 4. The only difference lies in the way how the SNR upper bound is determined, which can be addressed if RAN4 decides that there is a need to specify the requirement. Regarding Option 3, the assumption is that Rel-17 will address the open issue in the context of HST or in a more general sense? Some clarifications would be helpful.  |
| QC | Issue 2-1,2-2: support operator’s view on this, as explained in sub-topic 1-1Issue 2-3: both option 2 and 3 are fine for usBased on our theoretical analysis plus implementation margin, SINR measurement is not reliable when SNR > 5dB, therefore we propose option 2 from pure performance analysis point of view.However, we think option 3 is reasonable, too. SINR and RSRP both can be measured and used as metric for RRM. Knowing that ICI due to frequency offset has large impact on SINR measurement but negligible impact on RSRP, it makes much more sense to use RSRP instead of SINR under HST setting.  |
| vivo2 | Issue 2-3: SS-SINR[Replying Nokia] RAN4 scope for R17 may not be clear at this point. For R17 FeMIMO we notice that there is one bullet related to further HST enhancement, and discuss this issue in the RAN4 part of R17 FeMIMO may be a feasible solution, although the scope of WI needs to be updated. We are also fine to discuss it in possible RRM enhancement WI if such RAN4-lead WI is approved. We are open to discuss more detail at this moment. |

### 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** |
| [**R4-2006231**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006231.zip) | CMCC: for the scaling factor of time index detection, same principle with PSS/SSS detection and measurement need to be applied, which is “M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1” |
| Company B |
| Nokia, Nokia Shanghai Bell: In general, the CR is fine, but it would be good to clarify that the HST tables applies for FR1. |
| QC: we agree that no change in SSB index reading, hence this sentence may not needed? “*For UE configured with [highSpeedEnhancedMeasFlagNR], TSSB\_time\_index\_intra is specified in Table 9.2.5.1-3*.” |

## 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#1:**  **Addtional note in the spec for cell identification requirements in the connected mode** | **Issue 2-1: for cell identification requirements, whether additional note should be added in the specifications, such as Note x: Operation with scaling factor 1.5 may not be sufficient in all high speed deployments considered in this release of the specifications*** Option 1 (Nokia, Ericsson, MTK,): Yes
* Option 2 (CMCC, vivo, QC, HW, CATT,): No

8 companies discuss this issue. 5 companies prefer option 2. 3 companies prefer option 1. ***Recommendations for 2nd round:******Companies prefer option 1 think that there are some scenarios that the requirements may not be sufficient. Companies prefer option 2 think that it is necessary to avoid introducing confusion to the spec. However, the scenarios are related with velocity, ISD, etc. It is difficult to find the exact wording to enumerate all the applicable scenarios. Without the exact wording, the note will introduce confusion to the spec.*** ***This meeting is the last meeting for core part completion, to move forward, moderator would like to check with companies whether following suggestion is acceptable:******Instead of adding the note in the spec, the note is captured in the WF. And the wording of note can be further improved during the 2nd round discussion.*** |
| **Sub-topic 2-2: Applied DRX cycle in connected mode for HST** | **Issue 2-2: whether additional note is added to the spec, such as “Requirements with 0.64s and 1.28s DRX cycle may not be sufficient in all high speed deployments considered in this release of the specifications” should be added in NR high speed specifications”*** Option 1 (Nokia, Ericsson,): Yes, add a note that in HST the UE can be assumed to perform more than measurement per DRX cycle
* Option 2 (HW, CATT, CMCC, vivo, QC): No

7 companies discuss this issue. 5 companies prefer option 2. 2 companies prefer option 1. ***Recommendations for 2nd round:******More discussion is needed. This meeting is the last meeting for core part completion. Decision is expected to be made in this meeting, compromise is appreciated.*** |
| **2.2.3 Sub-topic 2-3: SS-SINR** | **Issue 2-3: SS-SINR** * Option 1 (CMCC, Ericsson,): Specify SS-SINR accuracy requirement for SNR <= [11] dB
* Option 2 (QC): SINR accuracy requirement is not applicable to HST scenario when SNR > 5dB
* Option 3 (vivo, HW, Ericsson, MTK, QC): SINR accuracy requirement is not applicable to HST scenario in R16. The issue can be left to R17.
* Option 4 (Nokia, HW, Ericsson): If RAN4 decides to specify SS-SINR accuracy requirements for HST, then reusing the Rel-15 intra-frequency SS-SINR accuracy requirements that apply to [-3] dB ≤ SNR ≤ [7] dB.

***Recommendations for 2nd round:******Companies’ views are diverse, it seems that it is difficult to align the views in the 2nd round. Since SS-SINR accuracy is covered in the performance part, it is suggested that this issue can be de-prioritized in this meeting, and can be further discussed in the next meeting.*** |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on RRM requirements for NR HST A single WF will be used to cover all the topics, as previous meeting’s way of working | CMCC |

### 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**  |
| [**R4-2006231**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006231.zip) | *to be revised* |

## Discussion on 2nd round (if applicable)

### Open issues for 2nd round

**Issue 2-1: for cell identification requirements, whether additional note should be added in the specifications, such as Note x: Operation with scaling factor 1.5 may not be sufficient in all high speed deployments considered in this release of the specifications**

* Proposals
	+ Option 1: Yes
	+ Option 2: No
* Recommended WF for 2nd round
* According to the 1st round discussion, Companies supporting option 1 think that there are some scenarios that the requirements may not be sufficient. Companies supporting option 2 think that it is necessary to avoid introducing confusion to the spec. Since the scenarios are related with velocity, ISD, etc. It is difficult to find the exact wording to enumerate all the applicable scenarios. Without the exact wording, the note will introduce confusion to the spec. Considering that this meeting is the last meeting for core part completion, to move forward, moderator would like to check with companies whether following suggestion is acceptable:
	+ Instead of adding the note in the spec, the note is captured in the WF. And companies are suggested to improve the wording of the note during the 2nd round discussion.

**Issue 2-2: whether additional note is added to the spec, such as “Requirements with 0.64s and 1.28s DRX cycle may not be sufficient in all high speed deployments considered in this release of the specifications” should be added in NR high speed specifications”**

* Proposals
	+ Option 1: Yes, add a note that in HST the UE can be assumed to perform more than measurement per DRX cycle
	+ Option 2: No
* Recommended WF for 2nd round
* More discussion is needed. This meeting is the last meeting for core part completion. Decision is expected to be made in this meeting, compromise is appreciated.

### Companies views’ collection for 2nd round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Issue 2-1: agree with recommended WF.Issue 2-2: option 2. Could we use the way of issue 2-1, i.e., capture the concern in the WF? |
| QC | Issue 2-1: agree with recommended WF.Issue 2-2: We oppose note on UE, this should be up to UE implementation, and the possibility of UE taking more than one measurement is obvious from the restriction on SMTC, no need for additional notes |
| Nokia | Issue 2-1:Same as for Issue 1-1. To progress the work and accounting the majority view, we can compromise to follow legacy approach. It would be good to capture the wording in a WF.Issue 2-2:If longer DRX cycles are configured and deployment covers highest velocity of 500kmh, current sampling assumption is clearly not sufficient. This is the reason why we a clarifying note stating that use of long DRX cycles at higher velocity may impact mobility. Alternative is to note that more measurement samples are assumed per measurement cycle when longer DRX cycles are used in HST scenario (or highest velocity is not supported with longest DRX cycles). This would be our preference.One comment to Qualcomm: it is true it can be left for UE implementation but in practical deployments this means that network will not know the UE implementation and can only rely on minimum performance. Network cannot know which UEs samples more often than minimum and will therefore not be able to use longer DRX cycles. In our view this sort of note could help in enabling use of longer DRX cycles even in HST. |
| CMCC | Issue 2-1: agree with recommended WFIssue 2-2: one possible way to move forward is to capture the note in the WF as suggested by HW. |
| vivo | Issue 2-1: agree with recommended WF.Issue 2-2: Similar view as Qualcomm. We do not think such note is needed. Yes RAN4 discuss and define RRM requirement based on the assumption that UE is required to perform at most one measurement per DRX cycle, but our understanding to that assumption is that it provides a baseline of balance between mobility performance and UE power consumption. UE implementation will not be limited by such assumption and such note may restrict UE implementation.For the long DRX cycle referred by Nokia, in our understanding this should be solved by network deployment. Although we discussed requirement for 500km/h, the real applicable scenario may be also below 500km/h, e.g. 350km/h. Although the baseline assumption is 700m distance between RRH in our understanding, even denser deployment is possible, and this is also related to the array gain for gNB. I think we can figure out some specific scenarios that some long DRX cycle may apply to. |
| Ericsson | Issue 2-1/2-2 : OK, we can follow the recommended WF. From our purposes the main reason for triggering this discussion was to try to capture this discussion so that BS or UE designers not in RAN4 would be aware to be more careful about using certain enahnced configurations. Since they are not going to look at the WF, we do not think it is worth spending too much time on refinement of the wording for this part of the WF. We propose**Delays with scaling factor M=1.5, M=2 may not be sufficient in all high speed deployments considered in this work item****Delays with DRX = 1.28s or 640s may not be sufficient in all high speed deployments considered in this work item**For issue 2-2 option 1 we prefer not to see a note like “that in HST the UE can be assumed to perform more than measurement per DRX cycle” in the spec. Although not explicitly said, this would give a false impression that the UE is not allowed to perform more measurements per DRX cycle in non HST by the absence of the note. Clearly this is allowed in any case (HST or non HST) as long as the UE meets the delay requirements.A note in the WF on applicable DRX cycles (using either wording) is OK for us to conclude this issue. |
| QC | We want to address Nokia’s concern here. Our understanding is that network only needs to know how long does it require for UE to detect/report measurement a neighboring cell, not how many samples UE takes to achieve necessary accuracy of detection and measurement. If the SNR condition is better, within 3DRx cycle, UE can report measurement with 3 samples to achieve required accuracy, we don’t have to assume UE takes 5 samples and should leave this up to UE implementation. |
| MTK | **Issue 2-2**We think Nokia’s concern is already addressed by current smart UE implementation. |

### CRs/TPs comments collection for 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revised [**R4-2006231**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006231.zip)(R4-2008629) | QC: from agreed WF in previous meeting on measurement requirement* + - For DRX > 320ms
			* 3 DRX cycles when SMTC <= 40ms, 5 DRX cycles when SMTC > 40ms

The CR doesn’t align to the WF, we update a revision to address it |
| CMCC: It is not possible to use TBD or [ ] in 38.133 due to ITU submission. In this CR, wording “[highSpeedEnhancedMeasFlagNR]” is suggested to be updated. Without knowing the exact RAN2 IE name, as suggested by Ericsson in the 1st round, some generic phrase like “if RRM enhancements for high speed are configured.” can be used. |
|  |
|  |

## 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**  |
| R4-2008629 | *This CR is agreeable* |

# Topic #3: RLM

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2008058**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008058.zip) | Nokia, Nokia Shanghai Bell | CR to TS 38.133: NR HST RLM requirements |

## Open issues summary

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

According to the contributions, there is no open issues on RLM. Moderator suggests companies provide comments on the CR

### 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** |
| [**R4-2008058**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_eBis/Docs/R4-2004297.zip) | huawei: it is agreed that the existing requirements of RLM are applied for HST. So the current requirements have covered both non-HST and HST cases. Thus we are doubt the necessity of the CR. |
| ericsson We share the view of Huawei, or at least if a clarification is needed there is no need to duplicate the table from the non HST case, However this CR could cause more confusion than clarification, because someone could think that if this requirement is updated with the exact same values for HST as non HST, then why are some other requirements not following this approach. And we don’t want to have to duplicate every non HST requirement for the HST case, since there are many things not touched. If proponent thinks it necessary a sentence like “requirements apply whether or not TBD\_HST\_Flag is configured” could be considered, but again I have a concern this may make other existing requirements that don’t have this sentence less clear, so I am not sure it helps. |
| Vivo: RLM requirement is not enhanced, and we suggest not to have CR on this topic.  |
| MTK: It seems the newly added tables are identical to their previous tables. Do not see the need to create a new table. It is OK to have some clarification say that the same requirement is applicable to HST and non-HST |
| CMCC: same comments as other companies, this CR is not needed. In Rel-14/16 LTE HST, for the requirements which are same for both HST and non-HST, no clarification is added. We prefer to use the same approach for NR HST. |
| Nokia, Nokia Shanghai Bell: Thanks for the comments. No strong preference for any specific solutions. It is OK to adopt the same approach as is done in LTE HST as long as it gives a very clear message that the non-HST requirement is also applicable to HST.  |

## 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#1** | *Tentative agreements:**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**  |
| [**R4-2008058**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008058.zip) | Since the RLM requirements are same for HST and non-HST, companies share common understanding that the CR is not needed. This CR is suggested to be noted. |

## Discussion on 2nd round (if applicable)

N/A

## 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: Beam management

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2008065**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008065.zip) | Nokia, Nokia Shanghai Bell | CR to TS 38.133: NR HST beam management requirements |

## Open issues summary

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

According to the contributions, there is no open issues on beam management. Moderator suggests companies provide comments on the CR

### 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** |
| [**R4-2008065**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008065.zip) | huawei: same comment as R4-2008058. |
| Ericsson same comment as for R4-2008058. For L1-RSRP there is a difference in scaling factor 1.5x, our preference would be to capture this in one table such as**Table 9.5.4.1-1: Measurement period TL1-RSRP\_Measurement\_Period\_SSB for FR1**

|  |  |
| --- | --- |
| **Configuration** | **TL1-RSRP\_Measurement\_Period\_SSB (ms)**  |
| non-DRX | max(TReport, ceil(M\*P)\*TSSB) |
| DRX cycle ≤ 320ms | max(TReport, ceil(k\*M\*P)\*max(TDRX,TSSB)) |
| DRX cycle > 320ms | ceil(M\*P)\*TDRX |
| Note 1:      TSSB = ssb-periodicityServingCell is the periodicity of the SSB-Index configured for L1-RSRP measurement. TDRX is the DRX cycle length. TReport is configured periodicity for reporting.Note 2:      k = 1.0 when TSSB <= 40ms and TBD\_HSTflag is configured. Otherwise k = 1.5.  |

 |
| MTK: It seems the newly added tables are identical to their previous tables. Do not see the need to create a new table. It is OK to have some clarification say that the same requirement is applicable to HST and non-HST |
| CMCC: for BFD, since the requirements are same for HST and non-HST, the CR are not necessary. While for L1-RSRP, since the condition of applying the scaling factor is introduced for HST, the CR is needed. |
| Nokia, Nokia Shanghai Bell:Thanks for the comments. It is OK to update the HST requirement for L1-RSRP reporting in one table if it is not confusing because “TBD\_HSTflag” only appears in Note 2 if we understanding correctly.  |

## 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#1** | *Tentative agreements:**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**  |
| [**R4-2008065**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008065.zip) | *to be revised* |

## Discussion on 2nd round (if applicable)

### CRs/TPs comments collection for 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revised [**R4-2008065**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2008065.zip)(R4-2008631) |  |
|  |
|  |
|  |
|   |

## 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**  |
| R4-2008631 | *This CR is agreeable* |

# Topic #5: Inter-RAT measurement

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2006771**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006771.zip) | CMCC | NR-EUTRA inter-RAT measurement requirementsProposal 1: for high speed scenario, the cell re-selection requirements on NR-EUTRA inter-RAT measurement are proposed as following:

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 2.56 (8) | 0.32(1) | 0.96(3) |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Proposal 2: for NR-EUTRA inter-RAT measurement requirements in connected mode with DRX, the TIdentify,E-UTRAN are proposed as following:

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|  | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<0.32 | Note1 (15) | Note1 (15) |
| 0.32<= DRx cycle <= 0.64 | Note1 (10) | Note1 (10) |
| 0.64 < DRx cycle <= 1.28 | Note1 (8) | Note1 (8) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20) | Note1 (20) |
| NOTE 1: The time depends on the DRX cycle length. |

EUTRA-NR inter-RAT measurement requirementsProposal 3: for high speed scenario, the EUTRA-NR inter-RAT cell re-selection requirements are proposed as following:Table: Tdetect,NR, Tmeasure,NR and Tevaluate,NR

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 2.56 x M2 (11 x M2) | 0.32 x M3 (1 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 5.12 (11) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96(10) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2 = M3 = M4 = 1 when SMTC < =40, and M2 = 1.5, M3 = M4 = 2 when SMTC >40 |

Proposal 4: for EUTRA-NR inter-RAT measurement requirements in connected mode, the cell identification requirements are proposed as following:

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra | T SSB\_measurement\_period\_intra | TSSB\_time\_index\_intra |
| No DRX | Max(600ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(200ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(120ms, 3 x max(MGRP, SMTC period)) ×Nfreq |
| DRX cycle < 320ms | Max(600ms, ceil( 8 × M) × max(MGRP, SMTC period, DRX cycle)) ×Nfreq | Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×Nfreq | Max(120ms, ceil(3 × M) x max(MGRP, SMTC period, DRX cycle)) ×Nfreq |
| DRX cycle≥320ms | 4× M × DRX cycle ×Nfreq | 4× M × DRX cycle ×Nfreq | [3] × DRX cycle ×Nfreq |
| Note 1: M = 1 when SMTC < =40, and M = 1.5 when SMTC >40 |

 |
| [**R4-2006773**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006773.zip) | CMCC | 36.133 CR on cell identification in connected mode for EUTRAN-NR measurement for Rel-16 NR HST |
| [**R4-2006984**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006984.zip) | Ericsson | Proposal 1 : RAN4 should target an RRM delay for interRAT measurements of not more than 2x the intrafrequency HST delay.Proposal 2 : Requirements for Cell re-selection for NR- EUTRA inter-RAT are specified as:

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra [s] (number of DRX cycles) |
| 0.32 |  5.76(16) | 0.64 (2) | 0.96(3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Proposal 3 : Requirements for Cell identification for NR- EUTRA inter-RAT are specified as:

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<0.32 | Note1 (15) | Note1 (15) |
| 0.32<= DRx cycle <= 1.28 | Note1 (10) | Note1 (10) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20) | Note1 (20) |
| NOTE 1: The time depends on the DRX cycle length. |

Proposal 4 : Requirements for Cell re-selection for EUTRA-NR inter-RAT are specified as:

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR [s] (number of DRX cycles) | Tmeasure,NR [s] (number of DRX cycles) | Tevaluate,NR [s] (number of DRX cycles) |
| 0.32 | 2.56 x M2 (8 x M2) | 0.32 x M3 (1 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2 = M3 = M4 = 1 when SMTC < =40, and M2 = 1.5, M3 = M4 = 2 when SMTC >40 |

Proposal 5 : Requirements for Cell identification for EUTRA-NR inter-RAT are specified as:

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle | TPSS/SSS\_sync\_intra | T SSB\_measurement\_period\_intra  | TSSB\_time\_index\_intra |
| No DRX | Max(600ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(200ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(120ms, 3 x max(MGRP, SMTC period)) ×Nfreq  |
| DRX cycle < 320ms | Max(600ms, ceil( 8 x M) x max(MGRP, SMTC period, DRX cycle)) ×Nfreq | Max(200ms, ceil(8 x M) x max(MGRP, SMTC period, DRX cycle))×Nfreq | Max(120ms, ceil(3 x M) x max(MGRP, SMTC period, DRX cycle)) ×Nfreq |
| DRX cycle≥320ms | 4xM x DRX cycle ×Nfreq | 4xM × DRX cycle ×Nfreq | [3] x DRX cycle ×Nfreq |
| Note 1: M = 1 when SMTC < =40, and M = 1.5 when SMTC >40 |

 |
| [**R4-2006985**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006985.zip) | Ericsson | Cell re-selection for EUTRAN-NR high speed in TS36.133 |
| [**R4-2007164**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007164.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: Cell re-selection requirements for EUTRA-NR inter-RAT in idle mode is based on option 1 in [1].Proposal 2: In option 1 the delay for the longest DRX cycle is reduced with 1 DRX cycle.Proposal 3: For E-UTRAN-NR inter-RAT measurement requirements:

|  |  |
| --- | --- |
| DRX | Option 4 |
| 0.32 | 6.08 |
| 0.64 | 8.96 |
| 1.28 | 11.52 |

Proposal 4: For NR-E-UREAN inter-RAT measurement requirements:

|  |  |
| --- | --- |
| DRX | Option 4 |
| 0.32 | 6.72 |
| 0.64 | 9.6 |
| 1.28 | 11.52 |

 |
| [**R4-2007165**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007165.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: EUTRA – NR Inter-RAT measurement requirements for LTE connected mode follow option 1 in [1] |
| [**R4-2007273**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007273.zip) | vivo | CR on cell re-selection requirement for NR-EUTRAN measurement in TS38.133 |
| [**R4-2007740**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007740.zip) | Huawei, Hisilicon | Proposal 1: Additional note of scaling factor is not needed.Proposal 2: R16 EUTRA HST enhanced cell reselection requirements can be reused for NR to EUTRA inter-RAT cell reselection.

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 2.56 (8) | 0.32(1) | 0.96(3) |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Proposal 3: For NR-EUTRA inter-RAT measurement in connected mode, the cell identification requirements for NR HST can be descripted as below,

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 |  Note1 (15\*CSSFinterRAT) |
| 0.32<DRx cycle <= 0.64 | Note1 (10\*CSSFinterRAT) |
| DRx cycle = 1.024 | Note1 (10\*CSSFinterRAT) | Note1 (10\*CSSFinterRAT) |
| DRx cycle = 1.28 | Note1 (8\*CSSFinterRAT | Note1 (8\*CSSFinterRAT) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT) | Note1 (20\*CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2. |

Proposal 4: The EUTRA-NR inter-RAT cell reselection requirements in NR HST can be specified as below,

|  |  |  |  |
| --- | --- | --- | --- |
| 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 | [3.52 x M2 (11 x M2)] | [0.32 x M3 (1 x M3)] | [0.96 x M4 (3 x M4)] |
| 0.64 | [7.04 (11)] | [0.64 (1)] | [1.92 (3)] |
| 1.28 | [12.8 (10)] | [1.28 (1)] | [3.84 (3)] |
| 2.56 | [58.88 (23)] | [2.56 (1)] | [7.68 (3)] |

 |
| [**R4-2007741**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007741.zip) | Huawei, Hisilicon | Cell identification in connected mode for NR-EUTRAN measurement in HST |
| [**R4-2006719**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006719.zip) | Qualcomm, Inc. | Observation 1: With relaxation factor M2 = 1.5 and M3 = 2, measurement requirement in DRx=0.32s is still sufficient for NR HST application scenarios.Observation 2: Connectivity might be affected in the worst-case scenario with 500km/h and ISD = 700m when M = 1.5. However, if ISD is larger than 700m or speed is slower than 500km/h, M=1.5 is a feasible configuration to maintain the connectivity.Proposal 1: Support operators view on whether to add a note for relaxation factor. Observation 3: Frequency offset considered in HST has significant impact on SINR measurement, especially in high SNR region.Proposal 2: SINR accuracy requirement is not applicable to HST scenario when SNR > 5dB.Proposal 3: Inter-RAT cell identification for LTE in NR SA requirement is specified by

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | TdetectEUTRA\_FDD [s] (number of DRX cycles) | TmeasureEUTRA\_FDD [s] (number of DRX cycles) | TevaluateEUTRA\_FDD[s] (number of DRX cycles) |
| 0.32 | 4.16 (13) | 0.96 (3) | 1.6 (5) |
| 0.64 | 8.32 (13) |  1.92 (3) | 3.2 (5) |
| 1.28 | 12.8 (10) | 2.56 (2) | 6.4 (5) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

Proposal 4: Inter-RAT cell identification for LTE in NR SA requirement is specified by

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|  | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<0.32 | Note1 (15) | Note1 (15) |
| 0.32<= DRx cycle <= 0.64 | Note1 (10) | Note1 (10) |
| 0.64 < DRx cycle <= 1.28 | Note1 (8) | Note1 (8) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20) | Note1 (20) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: The requirement only applicable to CSSFinterRAT = 1 case, otherwise number of DRx cycles should be scaled by CSSFinterRAT |

Proposal 5: Inter-RAT cell identification for LTE in NR SA requirement is specified by:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR [s] (number of DRX cycles) | Tmeasure,NR [s] (number of DRX cycles) | Tevaluate,NR[s] (number of DRX cycles) |  |
|  |
| 0.32 | 5.12 (16 x M) | 0.96xM (3 x M) | 1.6xM (5 x M) |   |
| 0.64 | 10.24 (16) |  1.92 (3) | 3.2 (5) |   |
| 1.28 | 16.64 (13) | 2.56 (2) | 6.4 (5) |   |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68(3) |   |
| Note 1: M = 1.5 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M=1. |  |

Proposal 6: Cell re-selection requirements on EUTRA-NR inter-RAT in idle mode follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_intra | T SSB\_measurement\_period\_intra   | TSSB\_time\_index\_intra |
| No DRX | max[600ms, [8] x max(MGRP, SMTC period)] × Nfreq | Max(200ms, 8 × Max(MGRP, SMTC period)) × Nfreq | max[120ms, [3] x max(MGRP, SMTC period)] × Nfreq |
| DRX cycle ≤ 320ms | max[600ms, ceil([8]xM) x max(MGRP, SMTC period, DRX cycle)] × Nfreq | Max(200ms, Ceil(8 × M) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq | max[120ms, ceil([3] x M) x max(MGRP, SMTC period, DRX cycle)] × Nfreq |
| DRX cycle > 320ms | 4xM x DRX cycle × Nfreq | 4xM × DRX cycle × Nfreq | [3] x DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When SMTC < =40ms, M=1; when SMTC >40ms, M = 1.5 |

 |
| [**R4-2007272**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007272.zip) | vivo | Proposal 1 Not to align serving cell and neighbour cell requirement for intra-frequency cell re-selection in NR HST.Proposal 2 If the alignment needs to be done, Table II is acceptable as a compromise. Table II. Compromised proposal for cell re-selection requirements for NR HST

|  |  |  |  |
| --- | --- | --- | --- |
| 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 | [2.56 x M2 (8 x M2)] | [0.64 x M3 (2 x M3)] | [0.96 x M4 (3 x M4)] |
| 0.64 | [5.12 (8)] | [1.28 (2)] | [1.92 (3)] |
| 1.28 | [8.96 (7)] | [1.28 (1)] | [3.84 (3)] |
| 2.56 | [58.88 (23)] | [2.56 (1)] | [7.68 (3)] |
| Note 1: when SMTC < =40ms, M2=M3=M4=1; when SMTC >40ms, M2 = M3 =1.5, M4 = 2 |

Proposal 3 No note is added to the HST requirements in TS 38.133.Observation 1 Due to high Doppler shift in HST scenario, ICI exists, and its impact is on both serving cell and neighbour cell SS-SINR accuracy.Proposal 4 For SS-SINR requirement in HST, adopt option 1, i.e. SINR accuracy requirement is not applicable to HST scenario in R16. The issue can be left to R17.Proposal 5 On NR-EUTRAN inter-RAT cell identification requirement in connected mode, slightly prefer option 1, i.e. adopt Table III. Table III Proposed NR-EUTRAN inter-RAT cell identification requirement in connected mode

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<0.32 | Note1 (15) | Note1 (15) |
| 0.32<= DRx cycle <= 1.28 | Note1 (10) | Note1 (10) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20) | Note1 (20) |
| NOTE 1: The time depends on the DRX cycle length. |

Proposal 6 On NR-EUTRAN inter-RAT cell measurement requirement in connected mode, R15 NR requirement can be reused for NR HST.Proposal 7 On EUTRAN-NR inter-RAT requirement in connected mode, adopt Table IV.Table IV. Proposed requirement for EUTRAN-NR inter-RAT requirement in connected mode

|  |  |  |  |
| --- | --- | --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_intra | T SSB\_measurement\_period\_intra   | TSSB\_time\_index\_intra |
| No DRX | max[600ms, 8 × max(MGRP, SMTC period)] × Nfreq | Max(200ms, 8 × Max(MGRP, SMTC period)) × Nfreq | max[120ms, 3 × max(MGRP, SMTC period)] × Nfreq |
| DRX cycle < 320ms | max[600ms, ceil(8 × M) × max(MGRP, SMTC period, DRX cycle)] × Nfreq | Max(200ms, Ceil(8 × M) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq | max[120ms, ceil(3 × M) × max(MGRP, SMTC period, DRX cycle)] × Nfreq |
| DRX cycle ≥ 320ms | 8 × M × DRX cycle × Nfreq | 6 × M × DRX cycle × Nfreq | 3 × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When SMTC < =40ms, M=1; when SMTC >40ms, M = 1.5 |

Proposal 8 On NR-EUTRAN inter-RAT cell reselection requirement, adopt option 2 or 3 in last meeting’s WF.Proposal 9 On EUTRAN-NR inter-RAT cell re-selection requirements, adopt Table V.Table V Proposed requirement for EUTRAN-NR inter-RAT cell reselection requirement

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR [s] (number of DRX cycles) | Tmeasure,NR [s] (number of DRX cycles) | Tevaluate,NR [s] (number of DRX cycles) |
|  |
| 0.32 | 5.12 x M1 (16 x M1) | 0.64 x M1 (2 x M1 ) | 0.96 x M2 (3 x M2) |  |
| 0.64 | 7.68 (12) | 1.28 (2 ) | 1.92(3) |  |
| 1.28 | 12.8 (10) | 1.28 (1 ) | 6.4(3) |  |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68(3) |  |
| Note 1: M1 = 1.5 and M2 = 2 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M1=M2=1. |  |

Proposal 10 NR HST RRM features should be ‘mandatory with capability signaling’, and no early implementation for HST RRM features is preferred. |

## 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: NR- EUTRA Inter-RAT measurement

**Issue 5-1: Cell re-selection requirements on NR- EUTRA inter-RAT measurement**

* Proposals
	+ Option 1 (CMCC, HW):

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 2.56 (8) | 0.32(1) | 0.96(3) |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

* + Option 2 (QC):

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | TdetectEUTRA\_FDD [s] (number of DRX cycles) | TmeasureEUTRA\_FDD [s] (number of DRX cycles) | TevaluateEUTRA\_FDD[s] (number of DRX cycles) |
| 0.32 | 4.16 (13) | 0.96 (3) | 1.6 (5) |
| 0.64 | 8.32 (13) |  1.92 (3) | 3.2 (5) |
| 1.28 | 12.8 (10) | 2.56 (2) | 6.4 (5) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

* + Option 3 (Ericsson, vivo, QC):

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **TdetectEUTRA\_FDD [s] (number of DRX cycles)** | **TmeasureEUTRA\_FDD [s] (number of DRX cycles)** | TevaluateEUTRA\_FDD**[s] (number of DRX cycles)** |
| 0.32 |  5.76(16) | 0.64 (2) | 0.96(3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

* + Option 4 (Nokia):

|  |  |
| --- | --- |
| **DRX** | **Overall delay** |
| **0.32** | **6.72** |
| **0.64** | **9.6** |
| **1.28** | **11.52** |

* Recommended WF
	+ 6 companies discuss this issue, and companies’ view are different.
	+ Taking companies’ view into consideration, to move forward, Moderator would like to check whether following compromised option is acceptable:

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **TdetectEUTRA\_FDD [s] (number of DRX cycles)** | **TmeasureEUTRA\_FDD [s] (number of DRX cycles)** | TevaluateEUTRA\_FDD**[s] (number of DRX cycles)** |
| 0.32 |  4.16(13) | 0.64 (2) | 0.96(3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

**Issue 5-2: NEUTRA\_carrier issue in the cell re-selection requirements on NR- EUTRA inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.**

**Background:**

NEUTRA\_carrier is the total number of configured E-UTRA carriers in the neighbour frequency list. In the current spec, the cell re-selection requirements for NEUTRA\_carrier is (NEUTRA\_carrier) \* Tdetect,EUTRAN.

In the last meeting, RAN4 agreed to introduce network flag per inter-RAT carrier to indicate UE whether the enhanced inter-RAT measurement requirements need to be applied to the inter-RAT carrier. As results, there will the case that EUTRA inter-RAT carrier includes both high speed carrier (NEUTRA\_carrier\_HST) and non-high-speed carrier (NEUTRA\_carrier\_nonHST). And for different type of carriers, different requirements applied.

The question is how to handle the case when both high speed carrier and non-high-speed carrier exists in the cell reselection requirements. This issue is more related on how to draft the CR on inter-RAT cell re-selection requirements

* Recommended WF
	+ Following the approach of current spec, in which the total cell re-selection delay is requirements per carrier multiplied by the number of carriers, Moderator would like to check with companies whether following suggestion is acceptable:
	+ The EUTRA inter-RAT cell reselection requirements for NEUTRA\_carrier is :

NEUTRA\_carrier\_HST \* Tdetect,EUTRAN\_HST + NEUTRA\_carrier\_nonHST \* Tdetect,EUTRAN\_nonHST

Where:

NEUTRA\_carrier is the total number of configured E-UTRA carriers,

NEUTRA\_carrier =NEUTRA\_carrier\_HST +NEUTRA\_carrier\_nonHST,

NEUTRA\_carrier\_HST is the total number of configured high speed carriers,

NEUTRA\_carrier\_nonHST is the total number of configured non-high-speed carriers.

Tdetect,EUTRAN\_HST is the requirements specified for high speed scenario.

Tdetect,EUTRAN\_nonHST is the requirements specified for normal scenario.

**Issue 5-3: Cell identification with DRX in connected mode**

* Proposals
	+ Option 1 (CMCC, QC):

|  |  |
| --- | --- |
| **DRX cycle length (s)** | **TIdentify, E-UTRAN TDD (s) (DRX cycles)** |
|  | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<0.32 | Note1 (15) | Note1 (15) |
| 0.32<= DRx cycle <= 0.64 | Note1 (10) | Note1 (10) |
| 0.64 < DRx cycle <= 1.28 | Note1 (8) | Note1 (8) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20) | Note1 (20) |
| NOTE 1: The time depends on the DRX cycle length. |

* + Option 2 (Ericsson, vivo):

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.3.2 apply | Non-DRX requirements in clause 9.4.3.2 apply |
| 0.16<DRx cycle<0.32 | Note1 (15) | Note1 (15) |
| 0.32<= DRx cycle <= 1.28 | Note1 (10) | Note1 (10) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20) | Note1 (20) |
| NOTE 1: The time depends on the DRX cycle length. |

* + Option 3 (HW)

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 |  Note1 (15\*CSSFinterRAT) |
| 0.32<DRx cycle <= 0.64 | Note1 (10\*CSSFinterRAT) |
| DRx cycle = 1.024 | Note1 (10\*CSSFinterRAT) | Note1 (10\*CSSFinterRAT) |
| DRx cycle = 1.28 | Note1 (8\*CSSFinterRAT | Note1 (8\*CSSFinterRAT) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\*CSSFinterRAT) | Note1 (20\*CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2. |

* Recommended WF
	+ 5 companies discuss this issue, and companies’ view are different.
	+ Taking companies’ view into consideration, and also considering the **non-decreasing principle**, Moderator would like to check whether following compromised option is acceptable:

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 |  Note1 (15\*CSSFinterRAT) |
| 0.32<DRx cycle <= 0.64 | Note1 (10\* CSSFinterRAT) |
| DRx cycle = 1.024 | Note1 (10\* CSSFinterRAT) | Note1 (10\* CSSFinterRAT) |
| DRx cycle = 1.28 | Note1 (8\* CSSFinterRAT | Note1 (8\* CSSFinterRAT) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\* CSSFinterRAT) | Note1 (20\* CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2. |

### Sub-topic 5-2: EUTRA – NR Inter-RAT measurement

**Issue 5-4: Cell re-selection requirements on EUTRA-NR inter-RAT**

* Proposals
	+ Option 1 (CMCC, Ericsson, HW):

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **Tdetect,EUTRAN\_Intra [s] (number of DRX cycles)** | **Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles)** | **Tevaluate,E-UTRAN\_intra****[s] (number of DRX cycles)** |
| 0.32 | 2.56 x M2 (11 x M2) | 0.32 x M3 (1 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 5.12 (11) | 0.64 (1) | 1.92 (3) |
| 1.28 | 8.96(10) | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2 = M3 = M4 = 1 when SMTC < =40, and M2 = 1.5, M3 = M4 = 2 when SMTC >40 |

* + Option 2 (QC):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR [s] (number of DRX cycles) | Tmeasure,NR [s] (number of DRX cycles) | Tevaluate,NR[s] (number of DRX cycles) |  |
|  |
| 0.32 | 5.12 (16 x M) | 0.96xM (3 x M) | 1.6xM (5 x M) |   |
| 0.64 | 10.24 (16) |  1.92 (3) | 3.2 (5) |   |
| 1.28 | 16.64 (13) | 2.56 (2) | 6.4 (5) |   |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68(3) |   |
| Note 1: M = 1.5 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M=1. |  |

* + Option 3 (vivo):

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR [s] (number of DRX cycles) | Tmeasure,NR [s] (number of DRX cycles) | Tevaluate,NR [s] (number of DRX cycles) |
|  |
| 0.32 | 5.12 x M1 (16 x M1) | 0.64 x M1 (2 x M1 ) | 0.96 x M2 (3 x M2) |  |
| 0.64 | 7.68 (12) | 1.28 (2 ) | 1.92(3) |  |
| 1.28 | 12.8 (10) | 1.28 (1 ) | 6.4(3) |  |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68(3) |  |
| Note 1: M1 = 1.5 and M2 = 2 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M1=M2=1. |  |

* + Option 4 (Nokia):

|  |  |
| --- | --- |
| **DRX** | **Overall delay** |
| **0.32** | **6.72** |
| **0.64** | **9.6** |
| **1.28** | **11.52** |

* Recommended WF
	+ 6 companies discuss this issue, and companies’ view are different.
	+ Taking companies’ view into consideration, to move forward, Moderator would like to check whether following compromised option is acceptable:

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 4.16 x M2 (13 x M2) | 0.64 x M3 (2 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56  | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2 = M3 = M4 = 1 when SMTC < =40, and M2 = 1.5, M3 = M4 = 2 when SMTC >40 |

**Issue 5-5: NNR\_carrier issue in the cell re-selection requirements on EUTRA-NR inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.**

**Background:**

NNR\_carrier is the total number of configured NR carriers in the neighbour frequency list for EUTRA-NR inter-RAT measurement. In the current spec, the cell re-selection requirements for NNR\_carrier is (NNR\_carrier) \* Tdetect,NR.

In the last meeting, RAN4 agreed to introduce network flag per inter-RAT carrier to indicate UE whether the enhanced inter-RAT measurement requirements need to be applied to the inter-RAT carrier. As results, there will the case that NR inter-RAT carrier includes both high speed carrier (NNR\_carrier\_HST) and non-high-speed carrier (NNR\_carrier\_nonHST). And for different type of carriers, different requirements applied.

The question is how to handle the case when both high speed carrier and non-high-speed carrier exists in the cell reselection requirements. This issue is more related on how to draft the CR on inter-RAT cell re-selection requirements

* Recommended WF
	+ Following the approach of current spec, in which the total cell re-selection delay is requirements per carrier multiplied by the number of carriers, Moderator would like to check with companies whether following suggestion is acceptable:
	+ The NR inter-RAT cell reselection requirements for NNR\_carrier is:

NNR\_carrier\_HST \* Tdetect,NR\_HST + NNR\_carrier\_nonHST \* Tdetect,NR\_nonHST

Where:

NNR\_carrier is the total number of configured NR carriers,

NNR\_carrier =NNR\_carrier\_HST +NNR\_carrier\_nonHST,

NNR\_carrier\_HST is the total number of configured high speed carriers,

NNR\_carrier\_nonHST is the total number of configured non-high-speed carriers.

Tdetect, NR\_HST is the requirements specified for high speed scenario.

Tdetect, NR\_nonHST is the requirements specified for normal scenario.

**Issue 5-6: Cell identification requirements in connected mode**

* Proposals
	+ Option 1 (CMCC, Ericsson, Nokia):

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle** | **TPSS/SSS\_sync\_intra** | **T SSB\_measurement\_period\_intra** | **TSSB\_time\_index\_intra** |
| No DRX | Max(600ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(200ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(120ms, 3 x max(MGRP, SMTC period)) ×Nfreq |
| DRX cycle < 320ms | Max(600ms, ceil( 8 × M) × max(MGRP, SMTC period, DRX cycle)) ×Nfreq | Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×Nfreq | Max(120ms, ceil(3 × M) x max(MGRP, SMTC period, DRX cycle)) ×Nfreq |
| DRX cycle≥320ms | 4× M × DRX cycle ×Nfreq | 4× M × DRX cycle ×Nfreq | [3] × DRX cycle ×Nfreq |
| Note 1: M = 1 when SMTC < =40, and M = 1.5 when SMTC >40 |

* + Option 2 (vivo):

|  |  |  |  |
| --- | --- | --- | --- |
| Condition NOTE1,2 | TPSS/SSS\_sync\_intra | T SSB\_measurement\_period\_intra   | TSSB\_time\_index\_intra |
| No DRX | max[600ms, 8 × max(MGRP, SMTC period)] × Nfreq | Max(200ms, 8 × Max(MGRP, SMTC period)) × Nfreq | max[120ms, 3 × max(MGRP, SMTC period)] × Nfreq |
| DRX cycle < 320ms | max[600ms, ceil(8 × M) × max(MGRP, SMTC period, DRX cycle)] × Nfreq | Max(200ms, Ceil(8 × M) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq | max[120ms, ceil(3 × M) × max(MGRP, SMTC period, DRX cycle)] × Nfreq |
| DRX cycle ≥ 320ms | 8 × M × DRX cycle × Nfreq | 6 × M × DRX cycle × Nfreq | 3 × DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When SMTC < =40ms, M=1; when SMTC >40ms, M = 1.5 |

* + Option 3 (QC):

|  |  |  |  |
| --- | --- | --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_intra** | **T SSB\_measurement\_period\_intra**  | **TSSB\_time\_index\_intra** |
| No DRX | max[600ms, [8] x max(MGRP, SMTC period)] × Nfreq | Max(200ms, 8 × Max(MGRP, SMTC period)) × Nfreq | max[120ms, [3] x max(MGRP, SMTC period)] × Nfreq |
| DRX cycle ≤ 320ms | max[600ms, ceil([8]xM) x max(MGRP, SMTC period, DRX cycle)] × Nfreq | Max(200ms, Ceil(8 × M) × Max(MGRP, SMTC period, DRX cycle)) × Nfreq | max[120ms, ceil([3] x M) x max(MGRP, SMTC period, DRX cycle)] × Nfreq |
| DRX cycle > 320ms | 4xM x DRX cycle × Nfreq | 4xM × DRX cycle × Nfreq | [3] x DRX cycle × Nfreq |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When SMTC < =40ms, M=1; when SMTC >40ms, M = 1.5 |

* Recommended WF
	+ 4 companies discuss this issue, companies’ views are different
	+ Taking companies’ view into consideration, to move forward, Moderator would like to check whether following compromised option is acceptable:

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle | TPSS/SSS\_sync\_NR | TSSB\_measurement\_period\_NR | TSSB\_time\_index\_NR |
| No DRX | Max(600ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(200ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(120ms, 3 x max(MGRP, SMTC period)) ×Nfreq |
| DRX cycle < 320ms | Max(600ms, ceil( 8 × M) × max(MGRP, SMTC period, DRX cycle)) ×Nfreq | Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×Nfreq | Max(120ms, ceil(3 × M) x max(MGRP, SMTC period, DRX cycle)) ×Nfreq |
| DRX cycle≥320ms | 8× M × DRX cycle ×Nfreq | 4× M × DRX cycle ×Nfreq | [3] × DRX cycle ×Nfreq |
| Note 1: M = 1 when SMTC < =40, and M = 1.5 when SMTC >40 |

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Sub topic 5-1: agree with the recommended WFSub topic 5-2: Ok with the scheme given in recommended WF.Sub topic 5-3: Support the recommended WF which is aligned with option3. In general, option 1,2,3 are on the same page and we all agreed to reuse the sample number of LTE HST. One thing needs to be noted is that the cell identification time without DRX for inter-RAT is longer than intra-frequency. The inter-RAT measurement delay without DRX is express:$$T\_{Identify, E-UTRAN FDD}=T\_{BasicIdentify}∙\frac{480}{T\_{Inter1}}∙CSSF\_{interRAT} ms$$Both gap pattern 40ms and 80ms are considered, the Tindentify without DRX is 3840ms and 7680ms respectively. Based on the non-decreasing principle, the option 3 is accurate.Sub topic 5-4:The line of 1.28s DRX in recommended WF is not acceptable for us, since at least 3 samples for AGC adjustment shall be considered.Sub topic 5-5: generally the scheme in the recommended WF is ok. The scheme in sub topic 5-2 and issue 5-5 shall be the same.Sub topic 5-6: agree with the recommended WF. |
| Ericsson | Subtopic 5-1 : Agree with the proposed WFSubtopic 5-2 : In practice we don’t think UE can realistically be configured with more than 1 NR carrier indicated as high speed since the reselection delays become too long. We are OK to agree to this approach for specification consistency.Subtopic 5-3 : OK for the proposed WF. Based on our analysis we think at least with MGRP=40ms the performance is sufficient.Subtopic 5-4: Agree with the proposed WFSubtopic 5-5 : OK, and we agree with Huawei that the conclusion should be the same as subtopic 5-2Subtopic 5-6 : Agree with the proposed WF |
| vivo  | **Issue 5-1: Cell re-selection requirements on NR- EUTRA inter-RAT measurement**We prefer option 3 and suggest to move forward with option 3.**Issue 5-2: NEUTRA\_carrier issue in the cell re-selection requirements on NR- EUTRA inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.**Regarding to this issue, we see solutions from companies in tdocs. In our view, this is similar to idle mode “CSSF” and the legacy behavior in R15 is one scaling factor “NEUTRA\_carrier” for all frequency layers.However, for HST carrier, maybe mobility performance is more important, and scaling factor “NEUTRA\_carrier” is probably too high for some scenarios where number of interRAT carriers is large.Therefore we provide two alternatives:Alt1: The scaling factor “NEUTRA\_carrier” is used for both HST carrier and non-HST carrier, i.e. follow R15.Alt2: For HST carrier, the scaling factor is NEUTRA\_carrier\_HST if NEUTRA\_carrier\_nonHST = 0 and 2\* NEUTRA\_carrier\_HST otherwise. For non-HST carrier, the scaling factor is NEUTRA\_carrier\_nonHST if NEUTRA\_carrier\_HST = 0 and 2\* NEUTRA\_carrier\_nonHST otherwise.Regarding to the approach provided by the moderator, we are confused what is the requirement for non-HST carrier and what is the requirement for HST carrier. For example, if 1 HST carrier and 1 non-HST carrier is configured, the requirement for HST carrier is “NNR\_carrier\_HST \* Tdetect,NR\_HST = Tdetect,NR\_HST” or “NNR\_carrier\_HST \* Tdetect,NR\_HST + NNR\_carrier\_nonHST \* Tdetect,NR\_nonHST = Tdetect,NR\_HST + Tdetect,NR\_nonHST” ?**Issue 5-3: Cell identification with DRX in connected mode**We are fine with moderator WF.**Issue 5-4: Cell re-selection requirements on EUTRA-NR inter-RAT**There is only small difference between recommended WF and option 3. For DRX =1.28, 7 sample is the same as intra-frequency reselection. We suggest to relax a little to take the AGC tuning into consideration, i.e. 10 samples. Regarding to DRX = 0.32, we think it is better to be 16 cycles.Therefore, we still support option 3.**Issue 5-5: NNR\_carrier issue in the cell re-selection requirements on EUTRA-NR inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.**Similar issue as 5-2. Similarly we provide two alternatives:Alt1: The scaling factor “NNR\_carrier” is used for both HST carrier and non-HST carrier, i.e. follow R15.Alt2: For HST carrier, the scaling factor is NNR\_carrier\_HST if NNR\_carrier\_nonHST = 0 and 2\* NNR\_carrier\_HST otherwise. For non-HST carrier, the scaling factor is NNR\_carrier\_nonHST if NNR\_carrier\_HST = 0 and 2\* NNR\_carrier\_nonHST otherwise.**Issue 5-6: Cell identification requirements in connected mode**We are generally fine with the recommended WF except for DRX = 320ms, TSSB\_measurement\_period\_intra should be 6 samples. |
| MTK | Sub topic 5-1: Fine with moderator’s WFSub topic 5-2: Fine with moderator’s WFSub topic 5-5: Fine with moderator’s WF. Alignment with sub topic 5-2 is neededSub topic 5-6: Fine with moderator’s WF |
| CMCC | **Issue 5-1: we are OK with the recommended WF****Issue 5-2: we are OK with the recommended WF. And we also fine with vivo’s suggestion that “NEUTRA\_carrier” is used for both HST carrier and non-HST carrier.** **Issue 5-3: we are OK with the recommended WF.****Issue 5-4: We are OK with the recommended WF.****Issue 5-5: we are OK with the recommended WF. And we also fine with vivo’s suggestion that “NNR\_carrier” is used for both HST carrier and non-HST carrier.****Issue 5-6: We are OK with the recommended WF.** |
| Nokia, Nokia Shanghai Bell | Sub-topic 5-1: Issue 5-1: Cell re-selection requirements on NR- EUTRA inter-RAT measurementWe can agree to the proposed WF. For the longest cycles it would be challenging to reach timely mobility at highest velocity.Sub-topic 5-1: Issue 5-2: NEUTRA\_carrier issue in the cell re-selection requirements on NR- EUTRA inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.We can agree to the proposed WF.Sub-topic 5-1: Issue 5-3: Cell identification with DRX in connected modeWe can agree to the proposed WF.Sub-topic 5-2: Issue 5-4: Cell re-selection requirements on EUTRA-NR inter-RATWe can agree to the proposed WF. For the longest cycles it would be challenging to reach timely mobility at highest velocity.Sub-topic 5-2: Issue 5-5:We can agree to the proposed WF. Agree with other companies that it should be aligned with 5-2Sub-topic 5-2: Issue 5-6: Cell identification requirements in connected modeWe can agree to the proposed WF. |
| QC | Issue 5-1 and 5-2:We can support recommended WF. Another option we can also support is Vivo’s alt1 with option 3 in issue 5-1. Issue 5-3: support recommended WF.Issue 5-4: we have the same view as Vivo, 10 DRx cycles are needed for 1.28s DRx case, 16 DRx cycles for 0.32DRx case. Based on our understanding, LTE has better coverage and less connectivity concern, we would prefer slower EUTRAN-NR measurement than NR-EUTRAN measurement.Issue 5-5: same as 5-2Issue 5-6: support recommended WF. |
| vivo2 | Issue 5-2 and 5-5[To moderator]Compared to the recommended WF, we think re-use R15 scaling factor, i.e alt1 in our previous proposal is better to guarantee UE performance in HST and slightly more clear in the spec. We suggest to check with companies whether this option is adoptable rather than the recommended WF. |

### 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** |
| [**R4-2006773**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006773.zip) | ericsson : to be updated based on agreements reached |
| Company B |
|  |
| [**R4-2006985**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006985.zip) | Ericsson : to be updated based on agreements reached (Ericsson CR) |
| Company B |
|  |
| [**R4-2007273**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007273.zip) | Ericsson : to be updated based on agreements reached |
| Company B |
|  |
| [**R4-2007741**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007741.zip) | Ericsson : to be updated based on agreements reached |
| 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 5-1: NR- EUTRA Inter-RAT measurement** | **Issue 5-1: Cell re-selection requirements on NR- EUTRA inter-RAT measurement*** Option 1 (HW, Ericsson, MTK, CMCC, Nokia, QC): recommend WF in 1st round

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **TdetectEUTRA\_FDD [s] (number of DRX cycles)** | **TmeasureEUTRA\_FDD [s] (number of DRX cycles)** | TevaluateEUTRA\_FDD**[s] (number of DRX cycles)** |
| 0.32 |  4.16(13) | 0.64 (2) | 0.96(3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

* Option 3 (vivo):

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **TdetectEUTRA\_FDD [s] (number of DRX cycles)** | **TmeasureEUTRA\_FDD [s] (number of DRX cycles)** | TevaluateEUTRA\_FDD**[s] (number of DRX cycles)** |
| 0.32 |  5.76(16) | 0.64 (2) | 0.96(3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

7 companies discussed this issue. 6 companies support option 1, 1 company prefer option 3. ***Recommendations for 2nd round:******Further discussion in the 2nd round. Since this is the last meeting for core part completion, decision is expected to be made in this meeting, compromise is appreciated.*****Issue 5-2: NEUTRA\_carrier issue in the cell re-selection requirements on NR- EUTRA inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.*** Option 1 (HW, Ericsson, MTK, CMCC, Nokia, QC): recommend WF in 1st round, the detail is as following:

The requirement for non-HST carrier = the requirement for HST carrier = NEUTRA\_carrier\_HST \* Tdetect,EUTRAN\_HST + NEUTRA\_carrier\_nonHST \* Tdetect,EUTRAN\_nonHSTWhere:NEUTRA\_carrier is the total number of configured E-UTRA carriers, NEUTRA\_carrier = NEUTRA\_carrier\_HST + NEUTRA\_carrier\_nonHST,NEUTRA\_carrier\_HST is the total number of configured high speed carriers, NEUTRA\_carrier\_nonHST is the total number of configured non-high-speed carriers. Tdetect,EUTRAN\_HST is the requirements specified for high speed scenario. Tdetect,EUTRAN\_nonHST is the requirements specified for normal scenario.* Option 2 (vivo): The scaling factor “NEUTRA\_carrier” is used for both HST carrier and non-HST carrier, i.e. follow R15. the detail is as following:

The requirement for HST carrier = NNR\_carrier \*Tdetect,EUTRAN\_HST ;The requirement for non-HST carrier = NNR\_carrier \* Tdetect,EUTRAN\_nonHST Where:NEUTRA\_carrier is the total number of configured E-UTRA carriers, NEUTRA\_carrier = NEUTRA\_carrier\_HST + NEUTRA\_carrier\_nonHST,NEUTRA\_carrier\_HST is the total number of configured high speed carriers, NEUTRA\_carrier\_nonHST is the total number of configured non-high-speed carriers. Tdetect,EUTRAN\_HST is the requirements specified for high speed scenario. Tdetect,EUTRAN\_nonHST is the requirements specified for normal scenario.7 companies discussed this issue. 6 companies support option 1, 1 company prefer option 2. Since option 2 is proposed during the 1st discussion, moderator would like to check with companies, compared with option 2, whether option1 is still preferable.***Recommendations for 2nd round:****Moderator would like to check with companies, compared with option 2, whether option1(recommended WF in 1st round) is still preferable.** *Option 1 (HW, Ericsson, MTK, CMCC, Nokia, QC): recommend WF in 1st round, the detail is as following:*

*The requirement for non-HST carrier = the requirement for HST carrier = NEUTRA\_carrier\_HST \* Tdetect,EUTRAN\_HST + NEUTRA\_carrier\_nonHST \* Tdetect,EUTRAN\_nonHST**Where:**NEUTRA\_carrier is the total number of configured E-UTRA carriers,* *NEUTRA\_carrier = NEUTRA\_carrier\_HST + NEUTRA\_carrier\_nonHST,**NEUTRA\_carrier\_HST is the total number of configured high speed carriers,* *NEUTRA\_carrier\_nonHST is the total number of configured non-high-speed carriers.* *Tdetect,EUTRAN\_HST is the requirements specified for high speed scenario.* *Tdetect,EUTRAN\_nonHST is the requirements specified for normal scenario.** *Option 2 (vivo): The scaling factor “NEUTRA\_carrier” is used for both HST carrier and non-HST carrier, i.e. follow R15. the detail is as following:*

*The requirement for HST carrier = NEUTRA\_carrier \*Tdetect,EUTRAN\_HST ;**The requirement for non-HST carrier = NEUTRA\_carrier \* Tdetect,EUTRAN\_nonHST;**Where:**NEUTRA\_carrier is the total number of configured E-UTRA carriers,* *NEUTRA\_carrier = NEUTRA\_carrier\_HST + NEUTRA\_carrier\_nonHST,**NEUTRA\_carrier\_HST is the total number of configured high speed carriers,* *NEUTRA\_carrier\_nonHST is the total number of configured non-high-speed carriers.* *Tdetect,EUTRAN\_HST is the requirements specified for high speed scenario.* *Tdetect,EUTRAN\_nonHST is the requirements specified for normal scenario.***Issue 5-3: Cell identification with DRX in connected mode*** Option 1 (HW, Ericsson, vivo, CMCC, Nokia, QC): recommend WF in 1st round

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 |  Note1 (15\*CSSFinterRAT) |
| 0.32<DRx cycle <= 0.64 | Note1 (10\* CSSFinterRAT) |
| DRx cycle = 1.024 | Note1 (10\* CSSFinterRAT) | Note1 (10\* CSSFinterRAT) |
| DRx cycle = 1.28 | Note1 (8\* CSSFinterRAT | Note1 (8\* CSSFinterRAT) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\* CSSFinterRAT) | Note1 (20\* CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2. |

6 companies provide comments on this issue. All the companies agree with the recommended WF.***Tentative agreements:*****Cell identification with DRX on NR- EUTRA inter-RAT measurement in connected mode**

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 |  Note1 (15\*CSSFinterRAT) |
| 0.32<DRx cycle <= 0.64 | Note1 (10\* CSSFinterRAT) |
| DRx cycle = 1.024 | Note1 (10\* CSSFinterRAT) | Note1 (10\* CSSFinterRAT) |
| DRx cycle = 1.28 | Note1 (8\* CSSFinterRAT | Note1 (8\* CSSFinterRAT) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\* CSSFinterRAT) | Note1 (20\* CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2. |

 |
| **Sub-topic 5-2: EUTRA– NR Inter-RAT measurement** | **Issue 5-4: Cell re-selection requirements on EUTRA-NR inter-RAT*** Option 1 (Ericsson, CMCC, Nokia): recommended WF in 1st round

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 4.16 x M2 (13 x M2) | 0.64 x M3 (2 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56  | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2 = M3 = M4 = 1 when SMTC < =40, and M2 = 1.5, M3 = M4 = 2 when SMTC >40 |

* Option 2 (HW): For 1.28s DRX cycle, prefer 10 samples taking AGC into account.

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 4.16 x M2 (13 x M2) | 0.64 x M3 (2 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 12.8(10) | 1.28 (1) | 3.84 (3) |
| 2.56  | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2 = M3 = M4 = 1 when SMTC < =40, and M2 = 1.5, M3 = M4 = 2 when SMTC >40 |

* Option 3 (QC, vivo): For 0.32s DRX cycle, prefer 16 samples. For 1.28s DRX cycle, prefer 10 samples taking AGC into account.

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 5.12 x M2 (16 x M2) | 0.64 x M3 (2 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 12.8(10) | 1.28 (1) | 3.84 (3) |
| 2.56  | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2 = M3 = M4 = 1 when SMTC < =40, and M2 = 1.5, M3 = M4 = 2 when SMTC >40 |

***Recommendations for 2nd round:******Further discussion in the 2nd round. Since this meeting is the last meeting for core part completion, companies are encouraged to provide compromise to move forward.*** **Issue 5-5: NNR\_carrier issue in the cell re-selection requirements on EUTRA-NR inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.*** Option 1 (HW, Ericsson, MTK, CMCC, Nokia, QC): recommend WF in 1st round, the detail is as following:

The requirement for non-HST carrier = the requirement for HST carrier = NNR\_carrier\_HST \* Tdetect, NR\_HST + NNR\_carrier\_nonHST \* Tdetect, NR\_nonHSTWhere:NNR\_carrier is the total number of configured NR carriers, NNR\_carrier = NNR\_carrier\_HST + NNR\_carrier\_nonHST,NNR\_carrier\_HST is the total number of configured high speed carriers, NNR\_carrier\_nonHST is the total number of configured non-high-speed carriers. Tdetect, NR\_HST is the requirements specified for high speed scenario. Tdetect, NR\_nonHST is the requirements specified for normal scenario.* Option 2 (vivo): The scaling factor “NNR\_carrier” is used for both HST carrier and non-HST carrier, i.e. follow R15. the detail is as following:

The requirement for HST carrier = NNR\_carrier \*Tdetect, NR\_HST;The requirement for non-HST carrier = NNR\_carrier \* Tdetect, NR\_nonHSTWhere:NNR\_carrier is the total number of configured NR carriers, NNR\_carrier = NNR\_carrier\_HST + NNR\_carrier\_nonHST,NNR\_carrier\_HST is the total number of configured high speed carriers, NNR\_carrier\_nonHST is the total number of configured non-high-speed carriers. Tdetect, NR\_HST is the requirements specified for high speed scenario. Tdetect, NR\_nonHST is the requirements specified for normal scenario.7 companies discussed this issue. 6 companies support option 1, 1 company prefer option 2. Since option 2 is proposed during the 1st discussion, moderator would like to check with companies, compared with option 2, whether option1 is still preferable.***Recommendations for 2nd round:****Moderator would like to check with companies, compared with option 2, whether option1(recommended WF in 1st round) is still preferable.** Option 1 (HW, Ericsson, MTK, CMCC, Nokia, QC): recommend WF in 1st round, the detail is as following:

The requirement for non-HST carrier = the requirement for HST carrier = NNR\_carrier\_HST \* Tdetect, NR\_HST + NNR\_carrier\_nonHST \* Tdetect, NR\_nonHSTWhere:NNR\_carrier is the total number of configured NR carriers, NNR\_carrier = NNR\_carrier\_HST + NNR\_carrier\_nonHST,NNR\_carrier\_HST is the total number of configured high speed carriers, NNR\_carrier\_nonHST is the total number of configured non-high-speed carriers. Tdetect, NR\_HST is the requirements specified for high speed scenario. Tdetect, NR\_nonHST is the requirements specified for normal scenario.* Option 2 (vivo): The scaling factor “NNR\_carrier” is used for both HST carrier and non-HST carrier, i.e. follow R15. the detail is as following:

The requirement for HST carrier = NNR\_carrier \*Tdetect, NR\_HST ;The requirement for non-HST carrier = NNR\_carrier \* Tdetect, NR\_nonHST;Where:NNR\_carrier is the total number of configured NR carriers, NNR\_carrier = NNR\_carrier\_HST + NNR\_carrier\_nonHST,NNR\_carrier\_HST is the total number of configured high speed carriers, NNR\_carrier\_nonHST is the total number of configured non-high-speed carriers. Tdetect, NR\_HST is the requirements specified for high speed scenario. Tdetect, NR\_nonHST is the requirements specified for normal scenario.**Issue 5-6: Cell identification requirements in connected mode*** Option 1(HW, Ericsson, MTK, CMCC, Nokia, QC): recommended WF in the 1st round

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle | TPSS/SSS\_sync\_NR | TSSB\_measurement\_period\_NR | TSSB\_time\_index\_NR |
| No DRX | Max(600ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(200ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(120ms, 3 x max(MGRP, SMTC period)) ×Nfreq |
| DRX cycle < 320ms | Max(600ms, ceil( 8 × M) × max(MGRP, SMTC period, DRX cycle)) ×Nfreq | Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×Nfreq | Max(120ms, ceil(3 × M) x max(MGRP, SMTC period, DRX cycle)) ×Nfreq |
| DRX cycle≥320ms | 8× M × DRX cycle ×Nfreq | 4× M × DRX cycle ×Nfreq | [3] × DRX cycle ×Nfreq |
| Note 1: M = 1 when SMTC < =40, and M = 1.5 when SMTC >40 |

* Option 2(vivo): for DRX = 320ms, TSSB\_measurement\_period\_intra should be 6 samples.

7 companies discussed this issue. 6 companies support option 1, 1 company prefer option 2. According to the contribution, there are 3 candidate options for this issue. And the recommended WF proposed in 1st round is a compromised solution taking companies’ view into account. Considering this is the last meeting for core part completion. To move forward, it is suggested that we could go with the compromised option.***Tentative agreements:*****Cell identification with DRX on EUTRA-NR inter-RAT measurement in connected mode**

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle | TPSS/SSS\_sync\_NR | TSSB\_measurement\_period\_NR | TSSB\_time\_index\_NR |
| No DRX | Max(600ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(200ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(120ms, 3 x max(MGRP, SMTC period)) ×Nfreq |
| DRX cycle < 320ms | Max(600ms, ceil( 8 × M) × max(MGRP, SMTC period, DRX cycle)) ×Nfreq | Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×Nfreq | Max(120ms, ceil(3 × M) x max(MGRP, SMTC period, DRX cycle)) ×Nfreq |
| DRX cycle≥320ms | 8× M × DRX cycle ×Nfreq | 4× M × DRX cycle ×Nfreq | [3] × DRX cycle ×Nfreq |
| Note 1: M = 1 when SMTC < =40, and M = 1.5 when SMTC >40 |

 |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on RRM requirements for NR HST A single WF will be used to cover all the topics, as previous meeting’s way of working | CMCC |

### 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**  |
| [**R4-2006773**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006773.zip) |  *to be revised* |
| [**R4-2006985**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006985.zip) | *to be revised* |
| [**R4-2007273**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007273.zip) | *to be revised* |
| [**R4-2007741**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007741.zip) | *to be revised* |

## Discussion on 2nd round (if applicable)

**Background:**

Issue 5-3: Cell identification with DRX on NR- EUTRA inter-RAT measurement in connected mode

**Tentative agreements in 1st round:**

|  |  |
| --- | --- |
| DRX cycle length (s) | TIdentify, E-UTRAN TDD (s) (DRX cycles) |
|   | Gap period = 40 ms, 20 ms | Gap period = 80 ms |
| ≤0.16 | Non-DRX requirements in clause 9.4.2.2 apply | Non-DRX requirements in clause 9.4.2.2 apply |
| 0.16<DRx cycle<=0.32 |  Note1 (15\*CSSFinterRAT) |
| 0.32<DRx cycle <= 0.64 | Note1 (10\* CSSFinterRAT) |
| DRx cycle = 1.024 | Note1 (10\* CSSFinterRAT) | Note1 (10\* CSSFinterRAT) |
| DRx cycle = 1.28 | Note1 (8\* CSSFinterRAT | Note1 (8\* CSSFinterRAT) |
| 1.28< DRX-cycle ≤10.24 | Note1 (20\* CSSFinterRAT) | Note1 (20\* CSSFinterRAT) |
| NOTE 1: The time depends on the DRX cycle length.NOTE 2: CSSFinterRAT is as defined in clause 9.4.3.2. |

Issue 5-6: Cell identification with DRX on EUTRA-NR inter-RAT measurement in connected mode

**Tentative agreements in 1st round:**

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle | TPSS/SSS\_sync\_NR | TSSB\_measurement\_period\_NR | TSSB\_time\_index\_NR |
| No DRX | Max(600ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(200ms, 8 x max(MGRP, SMTC period))×Nfreq | Max(120ms, 3 x max(MGRP, SMTC period)) ×Nfreq |
| DRX cycle < 320ms | Max(600ms, ceil( 8 × M) × max(MGRP, SMTC period, DRX cycle)) ×Nfreq | Max(200ms, ceil(8 × M) x max(MGRP, SMTC period, DRX cycle))×Nfreq | Max(120ms, ceil(3 × M) x max(MGRP, SMTC period, DRX cycle)) ×Nfreq |
| DRX cycle≥320ms | 8 × DRX cycle ×Nfreq | 4× M × DRX cycle ×Nfreq | [3] × DRX cycle ×Nfreq |
| Note 1: M = 1 when SMTC < =40, and M = 1.5 when SMTC >40 |

### Open issues for 2nd round

**Issue 5-1: Cell re-selection requirements on NR- EUTRA inter-RAT measurement**

* Option 1:

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **TdetectEUTRA\_FDD [s] (number of DRX cycles)** | **TmeasureEUTRA\_FDD [s] (number of DRX cycles)** | TevaluateEUTRA\_FDD**[s] (number of DRX cycles)** |
| 0.32 |  4.16(13) | 0.64 (2) | 0.96(3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

* Option 2:

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **TdetectEUTRA\_FDD [s] (number of DRX cycles)** | **TmeasureEUTRA\_FDD [s] (number of DRX cycles)** | TevaluateEUTRA\_FDD**[s] (number of DRX cycles)** |
| 0.32 |  5.76(16) | 0.64 (2) | 0.96(3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

**Recommended WF for 2nd round**

According to the contribution, there are 4 candidate options for this issue. Option 1 is a compromised solution taking companies’ view into account. And according to the 1st round discussion, most companies prefer Option1. To move forward, Moderator would like to check with companies whether option 1 (recommended WF in 1st round) is acceptable.

|  |  |  |  |
| --- | --- | --- | --- |
| **DRX cycle length [s]** | **TdetectEUTRA\_FDD [s] (number of DRX cycles)** | **TmeasureEUTRA\_FDD [s] (number of DRX cycles)** | TevaluateEUTRA\_FDD**[s] (number of DRX cycles)** |
| 0.32 |  4.16(13) | 0.64 (2) | 0.96(3) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 8.96(7) | 1.28 (1) | 3.84 (3) |
| 2.56 Note1 | 58.88 (23) | 2.56 (1) | 7.68 (3) |

**Issue 5-2: NEUTRA\_carrier issue in the cell re-selection requirements on NR- EUTRA inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.**

* Option 1: recommend WF in 1st round, the detail is as following:

The requirement for non-HST carrier = the requirement for HST carrier = NEUTRA\_carrier\_HST \* Tdetect,EUTRAN\_HST + NEUTRA\_carrier\_nonHST \* Tdetect,EUTRAN\_nonHST

Where:

NEUTRA\_carrier is the total number of configured E-UTRA carriers,

NEUTRA\_carrier = NEUTRA\_carrier\_HST + NEUTRA\_carrier\_nonHST,

NEUTRA\_carrier\_HST is the total number of configured high speed carriers,

NEUTRA\_carrier\_nonHST is the total number of configured non-high-speed carriers.

Tdetect,EUTRAN\_HST is the requirements specified for high speed scenario.

Tdetect,EUTRAN\_nonHST is the requirements specified for normal scenario.

* Option 2: The scaling factor “NEUTRA\_carrier” is used for both HST carrier and non-HST carrier, i.e. follow R15. the detail is as following:

The requirement for HST carrier = NNR\_carrier \*Tdetect,EUTRAN\_HST ;

The requirement for non-HST carrier = NNR\_carrier \* Tdetect,EUTRAN\_nonHST

Where:

NEUTRA\_carrier is the total number of configured E-UTRA carriers,

NEUTRA\_carrier = NEUTRA\_carrier\_HST + NEUTRA\_carrier\_nonHST,

NEUTRA\_carrier\_HST is the total number of configured high speed carriers,

NEUTRA\_carrier\_nonHST is the total number of configured non-high-speed carriers.

Tdetect,EUTRAN\_HST is the requirements specified for high speed scenario.

Tdetect,EUTRAN\_nonHST is the requirements specified for normal scenario.

**Recommended WF for 2nd round**

According to the 1st round discussion, Option 1 (recommend WF in 1st round) is agreeable to most of the companies. Since Option 2 is proposed during the 1st discussion, Moderator would like to have further check with companies, compared with option 2, whether option1(recommended WF in 1st round) is still preferable.

**Issue 5-4: Cell re-selection requirements on EUTRA-NR inter-RAT**

**Recommended WF for 2nd round:**

Taking companies’ view into account, to move forward, moderator would like to check with companies whether following option is acceptable:

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,EUTRAN\_Intra [s] (number of DRX cycles) | Tmeasure,EUTRAN\_Intra [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra[s] (number of DRX cycles) |
| 0.32 | 4.16 x M2 (13 x M2) | 0.64 x M3 (2 x M3) | 0.96 x M4 (3 x M4) |
| 0.64 | 7.68 (12) | 1.28 (2) | 1.92 (3) |
| 1.28 | 12.8(10) | 1.28 (1) | 3.84 (3) |
| 2.56  | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2 = M3 = M4 = 1 when SMTC < =40, and M2 = 1.5, M3 = M4 = 2 when SMTC >40 |

**Issue 5-5: NNR\_carrier issue in the cell re-selection requirements on EUTRA-NR inter-RAT measurement taking the per inter-RAT carrier flag into account. This issue is more related to how to draft the CR on inter-RAT cell re-selection requirements.**

* Option 1: recommend WF in 1st round, the detail is as following:

The requirement for non-HST carrier = the requirement for HST carrier = NNR\_carrier\_HST \* Tdetect, NR\_HST + NNR\_carrier\_nonHST \* Tdetect, NR\_nonHST

Where:

NNR\_carrier is the total number of configured NR carriers,

NNR\_carrier = NNR\_carrier\_HST + NNR\_carrier\_nonHST,

NNR\_carrier\_HST is the total number of configured high speed carriers,

NNR\_carrier\_nonHST is the total number of configured non-high-speed carriers.

Tdetect, NR\_HST is the requirements specified for high speed scenario.

Tdetect, NR\_nonHST is the requirements specified for normal scenario.

* Option 2: The scaling factor “NNR\_carrier” is used for both HST carrier and non-HST carrier, i.e. follow R15. the detail is as following:

The requirement for HST carrier = NNR\_carrier \*Tdetect, NR\_HST;

The requirement for non-HST carrier = NNR\_carrier \* Tdetect, NR\_nonHST

Where:

NNR\_carrier is the total number of configured NR carriers,

NNR\_carrier = NNR\_carrier\_HST + NNR\_carrier\_nonHST,

NNR\_carrier\_HST is the total number of configured high speed carriers,

NNR\_carrier\_nonHST is the total number of configured non-high-speed carriers.

Tdetect, NR\_HST is the requirements specified for high speed scenario.

Tdetect, NR\_nonHST is the requirements specified for normal scenario.

**Recommended WF for 2nd round:**

According to the 1st round discussion, Option 1 (recommend WF in 1st round) is agreeable to most of the companies. Since Option 2 is proposed during the 1st discussion, Moderator would like to have further check with companies, compared with option 2, whether option1(recommended WF in 1st round) is still preferable.

### Companies views’ collection for 2nd round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Sub topic 5-1: agree with the recommended WFSub topic 5-2: Support option 1. Regarding option 2:“The requirement for HST carrier = NNR\_carrier \*Tdetect,EUTRAN\_HST ;”With this equation, UE needs to perform enhanced HST measurements on the non-HST carriers in order to meet the HST requirements. In this case, the power saving gain by indicating of non-HST carriers is not observed.Sub topic 5-4: agree with recommended WF.Sub topic 5-5: Support option 1. The reason is same as issue 5-2. |
| QC | Subtopic 5-1: agree with the recommended WF if option 1 is selected in subtopic 5-2Subtopic 5-2: option 1 is preferred as it is simpler (same requirement across carriers) and more flexible for UE. Option 2 is acceptable but should go with option 2 in subtopic 5-1 as we commented in first round.Subtopic 5-4 and 5-5: same as 5-1 and 5-2, prefer recommended WF with option 1. Option 2 in 5-5 is acceptable but should go with option 3 in subtopic 5-4 in first round. |
| Nokia | Issue 5-1:We support the recommended WF.Issue 5-2:It seems reasonable as it allows UE time to detect cells based on the total number of carriers configured while depending on whether each carrier is HST or non-HST. However, we were wondering if it should be:The requirement for HST carrier = NNR\_carrier\_HST \*Tdetect, NR\_HSTThe requirement for non-HST carrier = NNR\_carrier\_nonHST \* Tdetect, NR\_nonHSTto give a correct scaling for each carrier type and the total time?Issue 5-4:We can compromise to this WF. Although we do see that long DRX and long detection in HST with the highest velocity is likely problematic.Issue 5-5:Same comment as for Issue 5-2. |
| CMCC | Issue 5-1: OK with the recommended WFIssue 5-2: option 1Issue 5-4: OK with the recommended WFIssue 5-5: option 1 |
| vivo | **Issue 5-1**We support option 2 but can compromise to option 1 if option 2 is selected in issue 5-2. If option 1 is selected in issue 5-2, we do not think reducing 3 samples for cell identification will help. For example, if 1 non-HST carrier and 1 HST carrier are configured, the required cell detection time for HST carrier when DRS = 0.32ms, in option 1 of issue 5-2, should be 13+36 = 49 DRX cycles. However, if option 2 of issue 5-2 is adopted, it should be 13 x 2 = 26 DRX cycles. We see nearly 23 DRX cycles differences between option 1 and option 2 in issue 5-2, so why do we need to argue for the additional 3 DRX cycles in Issue 5-1?**Issue 5-2**We do not have a strong opinion regarding to option 1 or option 2. The clarification of option 1 is not given in the first round discussion but only in the summary of the first round. Based on the clarification, although previously we support option 2, we can compromise to option 1.However, we think this might have reverted the agreement in previous meeting:*Introduce network flag in SIB to indicate whether enhanced inter-RAT measurement requirements are applied for LTE inter-RAT carrier and NR inter-RAT carrier*In option 1 we see the requirements for HST carrier and non-HST carrier is exactly the same. But if companies are fine to revert the agreement we are also fine.**Regarding comments from Huawei**, we think if option 2 is adopted, power saving gain can still be obtained. Again we will use 1 HST carrier and 1 non-HST carrier to illustrate the issue.Since for HST carrier mobility measurement can be done with 12 samples while DRX cycle = 0.64s, we think for non-HST carrier mobility measurement can also be done with 12 samples. Anyway we have already agreed in last meeting that UE is not required to perform detection or measurement that frequently on non-HST carriers. Therefore if UE performs measurement per 24 DRX cycles for non-HST carrier we still see power saving gain compared to the case if non-HST carrier is not configured, while non-HST carrier can meet the requirement of 28 DRX cycles.**Regarding comments from Nokia**, we think your suggestion is not feasible. Again if 1 HST carrier and 1 non-HST carrier are configured, UE cannot measure 1 HST carrier in every DRX cycle while performing measurement non-HST carrier at the same time.**Regarding comments from Qualcomm**, based on our understanding we think it is still feasible to adopt 13 DRX cycles in issue 5-1, if option 2 in issue 5-2 is adopted.**Issue 5-4**Yes we can compromise to the WF, but we feel if this is adopted then option 2 in issue 5-5 will also be adopted. If option 1 is adopted in issue 5-5, we think option 3 is a better choice.**Issue 5-5**Similar comment as issue 5-2. |
| Ericsson | **Issue 5-1 :** OK with recommended WF**Issue 5-2 :** No preference, as we think it will be very difficult to configure with 2 or more interRAT carrier when one of them is HST.**Issue 5- 4** : OK with recommended WF**Issue 5-5 :** Similar to 5-2, either option OK. |
| QC | We provided analysis to Nokia’s proposal in the comment in our contribution R4- 2006719. It will double the number of carriers UE has to search/measure hence it doesn’t work. |
| MTK | **Issue 5-2 and Issue 5-5**Option 1 is preferred, since UE has consider all HST and non-HST frequency layers to decide the measurement scheduling for IDLE mode |

### CRs/TPs comments collection for 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revised [**R4-2006773**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006773.zip)(R4-2008632) | Nokia, Nokia Shanghai Bell:Should “8.1.2.4.21.1.1-5A” be added to the following sentence:TSSB\_measurement\_period\_irat: equal to a measurement period of SSB based measurement given in table 8.1.2.4.21.1.1-5, 8.1.2.4.21.1.1-5A and table 8.1.2.4.21.1.1-6. |
|  |
|  |
| Revised [**R4-2006985**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006985.zip)(R4-2008633) | Nokia, Nokia Shanghai Bell:There is no Note 4 in table 4.2.2.5.6-2. Is “Note 3,4” needed for DRX cycle lengths of 0.64s, 1.28 s and 2.56 s in the table? |
|  |
|  |
| Revised [**R4-2007273**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007273.zip)(R4-2008634) |  |
|  |
|  |
| Revised [**R4-2007741**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007741.zip)(R4-2008635) |  |
|  |
|  |

## 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**  |
| R4-2008632 | *This CR is agreeable* |
| R4-2009240 | *TBA* |
| R4-2008634 | *This CR is agreeable* |
| R4-2008635 | *This CR is agreeable* |

# Topic #6: others

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2006770**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006770.zip) | CMCC | Proposal 2: Rel.16 HST RRM enhanced requirement are proposed to be release independent from Rel-15. |
| [**R4-2006965**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2006965.zip) | CMCC | LS on supporting Rel-16 NR HST RRM enhanced requirements from Rel-15 UEs |
| [**R4-2007272**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_95_e/Docs/R4-2007272.zip) | vivo | Proposal 10 NR HST RRM features should be ‘mandatory with capability signaling’, and no early implementation for HST RRM features is preferred. |

## Release independent

*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: release independent

**Issue 6-1: release independent issue**

**Q1: Whether Rel.16 NR HST RRM requirements can be release independent from Rel-15**

* Proposals
	+ Option 1 (CMCC): Rel.16 NR HST RRM enhanced requirements are release independent from Rel-15. And the approach of early implementation which is used in the release independent of Rel-14 LTE HST can be reused.
	+ Option 2 (vivo): no early implementation for HST RRM features is preferred

**Background:**

In the last meeting, a LS to RAN2 on supporting Rel-16 NR HST demodulation enhancement from Rel-15 UEs was agreed to check with RAN2 whether early implementation approach is applicable for NR HST demodulation enhancement (R4-2005533)

**Q2: Do we need to send LS to RAN2 to check whether “early implementation” approach is applicable for NR HST RRM enhancement?**

* Proposals
	+ Option 1 (CMCC): Yes
	+ Option 2: No
* Recommended WF
	+ More discussion is needed

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Sub topic 2-1: Sub topic 2-2:….Others: |
| Ericsson | Subtopic 2-1 : If early implementation is used for NR HST demod it would be strange not to have the same corresponding early implementation possible for RRM enhancementsSubtopic 2-2 : Since HST flag is in system information in both LTE and NR we do not see anything that would prevent an early UE from decoding the HST flag from the release 16 ASN.1 Ies, and moreover the signaling approach is the same between NR demod and NR RRM. So we do not see a compelling need to send a further LS to RAN2, but we are OK to do so if other companies have doubts that the same conclusion would apply for any reason. |
| Vivo  | **Issue 6-1: release independent issue**We prefer “No” to both questions.As discussed in our paper, compared to HST-SFN JT, features of NR HST RRM are new compared to LTE. The tightening of the RRM requirements impacts both physical layer and higher layer, and we are not sure if it is feasible for early implementation.Since R16 deployment is close, we suggest to follow the regular procedure this time, i.e. no early implementation for the HST RRM features. |
| CMCC | **Issue 6-1: release independent**High speed scenario is an important deployed scenario, and the improvement of UE experience is necessary, from CMCC point of view, it is preferred that Rel.16 NR HST RRM enhanced requirements are release independent from Rel-15. Like we did in Rel-14 LTE HST, both RRM enhancement and demodulation enhancement are release independent from Rel-13 UEs. We share similar view as Ericsson that if early implementation is used for NR HST demod, it would be strange not to have the same corresponding early implementation possible for RRM enhancements.We disagree with vivo that RRM enhancement has impact on physical layer. NR high speed scenario is supported in Rel-15 from RAN1 point of view, RAN4 does not specify the NR HST requirements in Rel-15 due to the limited timeline. Rel-16 NR HST WI focus on specifying requirements to support HST based on the current physical layer design, there is no RAN1 impact. As for the RAN2 impact, as we mentioned that early implementation can be considered.As for the LS, we share similar view with Ericsson that the signaling approach is the same between NR demod and NR RRM. If companies shave the common understanding that the feedback from RAN2 are also applied for NR HST RRM, we are OK not to send the LS on RRM, otherwise, it is necessary to send the LS.  |
| Nokia, Nokia Shanghai Bell | **Sub-topic 6-1: Issue 6-1: release independent issue**It is reasonable to follow the same approach as in Rel-14 LTE HST. Sending the LS is OK as a way to get confirmation from RAN2 in case there are open issues.  |
| vivo2 | [To CMCC]Based on discussion with some companies we are now fine with this early implementation if such feature is optional for a Rel.15 UE. Therefore we withdraw our support from option 2.Moreover, we support to send one additional LS to RAN2 to give RAN2 more clear information about RAN4 conclusion. |

### 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 |
|  |
| 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 6-1: release independent** | **Q1: Whether Rel.16 NR HST RRM requirements can be release independent from Rel-15*** Option 1 (CMCC, Ericsson, Nokia, vivo): Rel.16 NR HST RRM requirements can be release independent from Rel-15. If Rel.16 NR HST RRM requirements are release independent from Rel-15. The requirements are optional for Rel-15 UEs*.*

**Q2: Do we need to send LS to RAN2 to check whether “early implementation” approach is applicable for NR HST RRM enhancement?*** Option 1 (CMCC, Ericsson, Nokia, vivo): Yes

***Tentative agreements:******Rel.16 NR HST RRM requirements can be release independent from Rel-15.*** * ***Send LS to RAN2 to check with RAN2 whether “early implementation” approach is applicable for NR HST RRM enhancement***
* ***If Rel.16 NR HST RRM requirements are release independent from Rel-15. The requirements are optional for Rel-15 UEs.***

***Recommendations for 2nd round:***There is a contribution (R4-2006965) about the LS to RAN2 to check with RAN2 whether “early implementation” approach is applicable for NR HST RRM enhancement, companies are encouraged to provide comments on this LS during the 2nd round discussion.  |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on RRM requirements for NR HST A single WF will be used to cover all the topics, as previous meeting’s way of working | CMCC |

### 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)

**Background (Tentative agreements in 1st round):**

Rel.16 NR HST RRM requirements can be release independent from Rel-15.

* Send LS to RAN2 to check with RAN2 whether “early implementation” approach is applicable for NR HST RRM enhancement
* If Rel.16 NR HST RRM requirements are release independent from Rel-15. The requirements are optional for Rel-15 UEs.

### Open issues for 2nd round

There is a contribution (R4-2006965) about the LS to RAN2 to check with RAN2 whether “early implementation” approach is applicable for NR HST RRM enhancement, companies are encouraged to provide comments on this LS during the 2nd round discussion.

|  |  |
| --- | --- |
| **LS number** | **Comments collection** |
| R4-2006965 | Company A |
| Company B |
|  |

## 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**  |
| R4-2006965 | *This LS is agreeable* |