**3GPP TSG-RAN WG4 Meeting # 106 R4-230xxxx**

**Athens, Greece, 27 February –03 March, 2023**

**Agenda item:** 5.2.5.2, 5.2.5.3

**Source:** Moderator (Ericsson)

**Title:** Topic summary for [106][207] NR\_redcap

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.*

# Topic #1: Core part

Contributions from AI 5.2.5.3 are discussed here. Note that the contributions related to 1 Rx offset are moved to topic #2.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2302313 | MediaTek Inc. | Observation 1: The existing PTW for 5G NR can be up to 40.96s.Observation 2: RAN4 has already specified that “The measurement/evaluation shall not be performed across PTW’s”.Observation 3: The values of PTW length in Table 4.2B.2.9.2-6 and Table 4.2B.2.10.2-6 are larger than the largest specified PTW value.Observation 4: The requirements for eDRX with Rel-17 stationary RRM measurements relaxation are already specified.Proposal 1: RAN4 shall not define requirements for cases that require PTW larger than 40.96s.Proposal 2: Table 4.2B.2.9.2-6 and Table 4.2B.2.10.2-6 can be re-written after removing the highlighted rows as:Proposal 3: RAN4 shall follow the same approach used to define the requirements of eDRX with Rel-17 stationary measurement relaxation to define the requirements for eDRX with Rel-16 low mobility and not-at-cell edge measurements relaxation.Proposal 4: The new requirements for eDRX with Rel-16 low mobility measurements relaxation for intra-frequency are given in tables 4.2B.2.9.9-x1, 4.2B.2.9.9-x2, and 4.2B.2.9.9-x3.Proposal 5: The new requirements for eDRX with Rel-16 not-at-cell edge measurements relaxation for intra-frequency are given in tables 4.2B.2.9.10-x1, 4.2B.2.9.10-x2, and 4.2B.2.9.10-x3.Proposal 6: The new requirements for eDRX with Rel-16 low mobility measurements relaxation for Inter-frequency are given in tables 4.2B.2.10.9-x1, 4.2B.2.10.9-x2, and 4.2B.2.10.9-x3.Proposal 7: The new requirements for eDRX with Rel-16 not-at-cell edge measurements relaxation for inter-frequency are given in tables 4.2B.2.10.10-x1, 4.2B.2.10.10-x2, and 4.2B.2.10.10-x3.Proposal 8: The new requirements for eDRX with Rel-16 low mobility measurements relaxation for EUTRAN are given in tables 4.2B.2.11.9-x1, and 4.2B.2.11.9-x2.Proposal 9: The new requirements for eDRX with Rel-16 not-at-cell edge measurements relaxation for EUTRAN are given in tables 4.2B.2.11.10-x1, and 4.2B.2.11.10-x2. |
| R4-2300275 | Apple | Proposal:For IDLE intra-frequency and inter-frequency relaxed measurement requirement with eDRX in Table 4.2B.2.9.2-6 and Table 4.2B.2.10.2-6 of TS38.133, following parameters and requirement shall be applied:- Regarding DRX=1.28s, K3=4 and N1=4, and the PTW length shall be revised to ≥ 40.96s- Regarding DRX=2.56s, K3=4 and N1=2, and the PTW length shall be revised to ≥ 40.96s |
| R4-2302287 | Nokia, Nokia Shanghai Bell | The scaling factor N1 can be used to adjust the lower bound of PTW length for UE configured with eDRX\_IDLE cycle in FR2. 1. RAN4 to reduce the scaling factor N1 for lower bound of PTW length in FR2 to satisfy the maximum PTW duration as defined by RAN2.
 |
| R4-2301816 | Huawei, HiSilicon | Proposal 1: The condition of meeting inter-frequency cell reselection criteria shall be corrected: -for 1 Rx RedCap by a margin of at least 6 dB in FR1 for reselections based on ranking.Proposal 2: UE is not required to perform intra-frequency cell detection if the intra-frequency cell is already detected, where an intra-frequency cell is regarded as already detected if it has been meeting the following conditions:-The MO with the same SSB frequency has already be configured, and-During 5s before BWP switching, the UE has sent a valid measurement report for the MO with the same frequency, and the SSB measured remains detectable according to the cee identification conditions specified in clause 9.2 and 9.3 |
| R4-2301200 | ZTE Corporation | Proposal 1: RAN4 to consider the potential collision scenario when the NCD-SSB offset configured with 5ms. Proposal 2: The MG configuration selected by the network with the appropriate combination of gap offset and MGTA can solve the described collision problem.  |
| R4-2302642 | Qualcomm Incorporated | Observation 1: For the case when the UE performs handover to a BWP with un-measured SSB, UE has no way to tell which measurement values to be used from the previously measured SSBs having the same PCI.Proposal 1: Revise the agreement from the previous meeting as below:* For the case when the UE performs measurement on a SSB and handover to a BWP with un-measured SSB, the following apply:
	+ The requirements apply for the scenario where the measured SSB and the SSB in the target BWP for HO belong to the same target cell, i.e., they share the same physCellID (PCI)
	+ UE may assume that the TX power of the SSB of the target cell’s active BWP is same as that of the measured SSBs that belong to the same PCI
* Note: the above agreement is for RedCap, where the measured SSB and the target SSB for HO of the same target cell are:
	+ NCD-SSB and NCD-SSB, respectively
	+ CD-SSB and NCD-SSB, respectively
	+ NCD-SSB and CD-SSB, respectively
* One additional sample is needed for known inter-frequency handover.

Observation 2: The definition of intra-frequency and inter-frequency handover for RedCap UEs is not clear in the spec (TS 38.133).Observation 3: Defining intra/inter-frequency handover same as intra/inter-frequency measurement type may not apply for unknown cell handover cases.* A measurement is defined as a SSB based intra-frequency measurement provided the centre frequency of the reference SSB of the serving cell and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same. The reference SSB is the SSB defined in BWP-specific *servingCellMO* under *BWP-DownlinkDedicated* of active DL BWP. If the field is absent, the reference SSB is the SSB defined in *servingCellMO* under *ServingCellConfig*

Proposal 2: RAN4 to clarify the definition of intra-frequency and inter-frequency handover in the spec.Proposal 3: Handover for a RedCap UE is defined as intra-frequency handover if the center frequency and subcarrier spacing (SCS) of the reference SSB of the serving cell is same as the center frequency and SCS of the reference SSB of the target cell, where:* The reference SSB of the serving cell is the SSB configured in the *BWP-specific* *servingCellMO*, if configured, else the SSB configured in the *servingCellMO*
* The reference SSB of the target cell is the SSB configured in the *firstActiveBWP* of the target cell

Observation 4: The definition of intra-frequency and inter-frequency cell for RRC re-establishment preocedure for RedCap UEs is not clear in the spec (TS 38.133).Proposal 4: RAN4 to clarify the definition of intra-frequency and inter-frequency cell for RRC re-establishment procedure for RedCap UEs in the spec.Proposal 5: A neighbor cell for RRC re-establishment procedures for a RedCap UE is defined as an intra-frequency cell if the center frequency (and subcarrier spacing (SCS)) of the reference SSB of the serving cell is same as the center frequency (and SCS) of the reference SSB of the neighbor cell; else it is considered as inter-frequency cell, where:* The reference SSB of the target cell is the CD-SSB of the target cell
* The reference SSB of the serving cell is
	+ Option 1: SSB configured in the *BWP-specific* *servingCellMO*, if configured, else the SSB configured in the *servingCellMO*
	+ Option 2: CD-SSB of the serving cell
	+ Option 3: SSB within the active BWP
 |

## Open issues summary

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

### Sub-topic 1-1 PTW length for measurements with relaxation

*Sub-topic description:* According to RAN2#115e agreements [R2-2109301]:

* The maximum PTW length is 40.96s when IDLE eDRX cycle is longer than 10.24s.
* The minimum PTW length is 1.28s and the step length/granularity of PTW length is 1.28 when IDLE eDRX cycle is longer than 10.24s.

This contradicts with RAN4 agreements on minimum PTW length for the case when the UE is relaxed measurement mode with eDRX, where PTW length exceeds the maximum PTW length allowed in RAN2.

*Open issues and candidate options before meeting:*

**Issue 1-1-1: Minimum PTW length for measurements when relaxation criteria is met**

* Proposals
	+ Option 1 (Apple): Reduce relaxation factor K3 and beam sweeping factor N1 to satisfy PTW ≥ 40.96 sec as follows:
		- * For DRX=1.28, K3=4 and N1=4
			* For DRX=2.56, K3=4, N1=2
		- Option 1a (Nokia): Reduce sweeping factor N1 to satisfy PTW ≥ 40.96
			* For DRX=1.28, N1=2
			* For DRX=2.56, N1=1
	+ Option 2 (MTK): Do not define requirements for cases that require PTW larger than 40.96s.

|  |
| --- |
| **Online session (Monday / Feb 27th)**Issue 1-1-1: Minimum PTW length for measurements when relaxation criteria is met* Proposals
	+ Option 1 (Apple): Reduce relaxation factor K3 and beam sweeping factor N1 to satisfy PTW ≥ 40.96 sec as follows:
		- For DRX=1.28, K3=4 and N1=4
		- For DRX=2.56, K3=4, N1=2
	+ Option 1a (Nokia): Reduce sweeping factor N1 to satisfy PTW ≥ 40.96
		- For DRX=1.28, N1=2
		- For DRX=2.56, N1=1
	+ Option 2 (MTK): Do not define requirements for cases that require PTW larger than 40.96s.
* Discussion
	+ QC: prefer not to change N1 and open to change K3
	+ vivo: For Option 1 we have same preference as QC. If K3 modification does not help then we can change N1.
	+ MTK: we realized that we cannot changed K3 below than in Option 1. So, we proposed Option 2 and consider this scenario as a corner case
 |

* Recommended WF

Check whether following alternative proposal is agreeable:

* Do not explicitly reduce/state the N1 or K3 values for DRX cycles of 1.28 and 2.56 , but UE is allowed to use any combination of N1 and K3 (as per earlier agreements) provided that the PTW does not exceed 40.96 sec.

### Sub-topic 1-2 Applicability of eDRX for Rel-16 RRM relaxation for RedCap

*Sub-topic description* eDRX requirements for IDLE/INACTIVE state operation with and without relaxation mode was introduced for RedCap in Rel-17. Rel-17 RedCap also supports the IDLE/INACTIVE state relaxation mechanism introduced in Rel-16 which are defined with DRX only (no eDRX).

*Open issues and candidate options before meeting:*

**Issue 1-2-1: eDRX for Rel-16 RRM relaxation for RedCap**

* Proposals
	+ Option 1 (MTK): RAN4 shall follow the same approach used to define the requirements of eDRX with Rel-17 stationary measurement relaxation to define the requirements for eDRX with Rel-16 low mobility and not-at-cell edge measurements relaxation.
* Recommended WF
	+ Discuss the option.

**Issue 1-2-2: eDRX intra-frequency requirements when meeting Rel-16 low mobility criterion for RedCap**

* Proposals
	+ Option 1 (MTK): The new requirements for eDRX with Rel-16 low mobility measurements relaxation for intra-frequency are given in tables 4.2B.2.9.9-x1, 4.2B.2.9.9-x2, and 4.2B.2.9.9-x3.

Table 4.2B.2.9.9-x1: Tdetect,NR\_Intra\_RedCap\_Relax, Tmeasure,NR\_Intra\_RedCap\_Relax and Tevaluate,NR\_Intra\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle for eDRX\_IDLE cycle upto 10.24 s for 1 Rx and 2 Rx RedCap UE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRX\_IDLE cycle length [s] | Scaling Factor (N1) | Tdetect,NR\_Intra\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tmeasure,NR\_Intra\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tevaluate,NR\_Intra\_RedCap\_Relax [s] (number of eDRX IDLE cycles) |
|  | FR1 | FR2Note1,2 |
| 2.56 | 1 | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| 5.12 | 117.76 x N1 x K1 (23 x N1 x K1) | 5.12 x N1 x K1 (1 x N1 x K1) | 10.24 x N1 x K1 (2 x N1 x K1) |
| 10.24 | 235.52 x N1 x K1 (23 x N1 x K1) | 10.24 x N1 x K1 (1 x N1 x K1) | 20.48 x N1 x K1 (2 x N1 x K1) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.Note 2: FR2 requirements are only applicable for 2 RX RedCap UE.Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvaluation* [2] criterion. |

Table 4.2B.2.9.9-x2: Tdetect,NR\_Intra\_RedCap\_Relax, Tmeasure,NR\_Intra\_RedCap\_elax and Tevaluate,NR\_Intra\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Tdetect,NR\_Intra\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,NR\_Intra\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,NR\_Intra\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥[3.84] ([3]) | $$eDRX\\_cycle\\_length×\left⌈\frac{23}{PTW/DRX\\_cycle\\_length}\right⌉x K1$$(23 x K1) | 0.32 x M2 x K1 (1 x M2 x K1) | 0.64 x M2 x K1 (2 x M2 x K1) |
| 0.64 | ≥[3.84] ([3]) | 0.64 x K1 (1 x K1) | 1.28 x K1 (2 x K1) |
| 1.28 | ≥[7.68] ([6]) | 1.28 x K1 (1 x K1) | 2.56 x K1 (2 x K1) |
| 2.56 | ≥[15.36] ([12]) | 2.56 x K1 (1 x K1) | 5.12 x K1 (2 x K1) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 3: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 4: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. Note 5: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvaluation* [2] criterion. |

Table 4.2B.2.9.9-x3: Tdetect,NR\_Intra\_RedCap\_Relax, Tmeasure,NR\_Intra\_RedCap\_Relax and Tevaluate,NR\_Intra\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Scaling Factor (N1)** Note1 | **Tdetect,NR\_Intra\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,NR\_Intra\_RedCap\_Relax** **[s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,NR\_Intra\_RedCap\_Relax****[s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥15.36 (12) | 8 | K1 x $eDRX\\_cycle\\_length×\left⌈\frac{23×N1}{PTW/DRX\\_cycle\\_length}\right⌉$(23 x N1 x K1) | 0.32 x N1 x K1 (1 x N1 x K1) | 0.64 x N1 x K1 (2 x N1 x K1) |
| 0.64 | ≥19.2 (15) | 5 | 0.64 x N1 x K1 (1 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) |
| 1.28 | ≥30.72 (24) | 4 | 1.28 x N1 x K1 (1 x N1 x K1) | 2.56 x N1 x K1 (2 x N1 x K1) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 3: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 4: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 5: The measurement shall not be performed across PTW’s. In this case the measurement is performed in the next available PTW.Note 6: The evaluation shall not be performed across PTW’s. In this case the evaluation is performed in the next available PTW.Note 7: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvaluation criterion* [2]. |

* Recommended WF
	+ Check if option 1 is agreeable based on the conclusion of issue 1-2.

**Issue 1-2-3: eDRX inter-frequency requirements when meeting Rel-16 low mobility criterion for RedCap**

* Proposals
	+ Option 1 (MTK): The new requirements for eDRX with Rel-16 low mobility measurements relaxation for Inter-frequency are given in tables 4.2B.2.10.9-x1, 4.2B.2.10.9-x2, and 4.2B.2.10.9-x3.

Table 4.2B.2.10.9-x1: Tdetect,NR\_Inter\_RedCap\_Relax, Tmeasure,NR\_Inter\_RedCap\_Relax and Tevaluate,NR\_Inter\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle for eDRX\_IDLE cycle upto 10.24 s for 1 Rx and 2 Rx RedCap UE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | Scaling Factor (N1) | Tdetect,NR\_Inter\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tmeasure,NR\_Inter\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tevaluate,NR\_Inter\_RedCap\_Relax [s] (number of eDRX IDLE cycles) |
|  | FR1 | FR2Note1,2 |
| 2.56 | 1 | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| 5.12 | 117.76 x N1 x K1 (23 x N1 x K1) | 5.12 x N1 x K1 (1 x N1 x K1) | 10.24 x N1 x K1 (2 x N1 x K1) |
| 10.24 | 235.52 x N1 x K1 (23 x N1 x K1) | 10.24 x N1 x K1 (1 x N1 x K1) | 20.48 x N1 x K1 (2 x N1 x K1) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.Note 2: FR2 requirements are only applicable for 2 RX RedCap UE.Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvaluation* [2] criterion. |

Table 4.2B.2.10.9-x2: Tdetect,NR\_Inter\_RedCap\_Relax, Tmeasure,NR\_Inter\_RedCap\_elax and Tevaluate,NR\_Inter\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Tdetect,NR\_Inter\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,NR\_Inter\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,NR\_Inter\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥[3.84] ([3]) | $$eDRX\\_cycle\\_length×\left⌈\frac{23}{PTW/DRX\\_cycle\\_length}\right⌉x K1$$(23 x K1) | 0.32 x 1.5 x K1 (1 x M2 x K1) | 0.64 x 1.5 x K1 (2 x M2 x K1) |
| 0.64 | ≥[3.84] ([3]) | 0.64 x K1 (1 x K1) | 1.28 x K1 (2 x K1) |
| 1.28 | ≥[7.68] ([6]) | 1.28 x K1 (1 x K1) | 2.56 x K1 (2 x K1) |
| 2.56 | ≥[15.36] ([12]) | 2.56 x K1 (1 x K1) | 5.12 x K1 (2 x K1) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 3: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 4: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvaluation* [2] criterion. |

Table 4.2B.2.10.9-x3: Tdetect,NR\_Inter\_RedCap\_Relax, Tmeasure,NR\_Inter\_RedCap\_Relax and Tevaluate,NR\_Inter\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Scaling Factor (N1)** Note1 | **Tdetect,NR\_Inter\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,NR\_Inter\_RedCap\_Relax** **[s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,NR\_Inter\_RedCap\_Relax****[s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥15.36 (12) | 8 | K1 x $eDRX\\_cycle\\_length×\left⌈\frac{23×N1}{PTW/DRX\\_cycle\\_length}\right⌉$(23 x N1 x K1) | 0.32 x N1 x K1 (1 x N1 x K1) | 0.64 x N1 x K1 (2 x N1 x K1) |
| 0.64 | ≥19.2 (15) | 5 | 0.64 x N1 x K1 (1 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) |
| 1.28 | ≥30.72 (24) | 4 | 1.28 x N1 x K1 (1 x N1 x K1) | 2.56 x N1 x K1 (2 x N1 x K1) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 3: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 4: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 5: The measurement shall not be performed across PTW’s. In this case the measurement is performed in the next available PTW.Note 6: The evaluation shall not be performed across PTW’s. In this case the evaluation is performed in the next available PTW.Note 7: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvaluation criterion* [2]. |

* Recommended WF
	+ Check if option 1 is agreeable based on the conclusion of issue 1-2.

**Issue 1-2-4: eDRX inter-RAT (EUTRAN) requirements when meeting Rel-16 low mobility criterion for RedCap**

* Proposals
	+ Option 1 (MTK): The new requirements for eDRX with Rel-16 low mobility measurements relaxation for EUTRAN are given in tables 4.2B.2.11.9-x1, and 4.2B.2.11.9-x2.

Table 4.2B.2.11.9-x1: Tdetect,EUTRAN\_Relax, Tmeasure, EUTRAN\_RedCap\_Relax and Tevaluate, EUTRAN\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle for eDRX\_IDLE cycle upto 10.24 s for 1 Rx and 2 Rx RedCap UE

|  |  |  |  |
| --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | Tdetect, EUTRAN\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tmeasure, EUTRAN\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tevaluate, EUTRAN\_RedCap\_Relax [s] (number of eDRX IDLE cycles) |
|  |
| 5.12 | 117.76 x K1 (23 x K1) | 5.12 x K1 (1 x K1) | 10.24 x K1 (2 x K1) |
| 10.24 | 235.52 x K1 (23 x K1) | 10.24 x K1 (1 x K1) | 20.48 x K1 (2 x K1) |
| Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvaluation* [2] criterion. |

Table 4.2B.2.11.9-x2: Tdetect, EUTRAN\_RedCap\_Relax, Tmeasure, EUTRAN\_RedCap\_elax and Tevaluate, EUTRAN\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Tdetect,****EUTRAN\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,EUTRAN\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,EUTRAN\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥[3.84] ([3]) | $$eDRX\\_cycle\\_length×\left⌈\frac{23}{PTW/DRX\\_cycle\\_length}\right⌉x K1$$(23 x K1) | 0.32 x K1 (1 x K1) | 0.64 x K1 (2 x K1) |
| 0.64 | ≥[3.84] ([3]) | 0.64 x K1 (1 x K1) | 1.28 x K1 (2 x K1) |
| 1.28 | ≥[7.68] ([6]) | 1.28 x K1 (1 x K1) | 2.56 x K1 (2 x K1) |
| 2.56 | ≥[15.36] ([12]) | 2.56 x K1 (1 x K1) | 5.12 x K1 (2 x K1) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 3: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 4: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *lowMobilityEvaluation* [2] criterion. |

* Recommended WF
	+ Check if option 1 is agreeable based on the conclusion of issue 1-2.

**Issue 1-2-5: eDRX intra-frequency requirements when meeting Rel-16 not-at-cell-edge mobility criterion for RedCap**

* Proposals
	+ Option 1 (MTK): The new requirements for eDRX with Rel-16 not-at-cell edge measurements relaxation for intra-frequency are given in tables 4.2B.2.9.10-x1, 4.2B.2.9.10-x2, and 4.2B.2.9.10-x3.

Table 4.2B.2.9.10-x1: Tdetect,NR\_Intra\_RedCap\_Relax, Tmeasure,NR\_Intra\_RedCap\_Relax and Tevaluate,NR\_Intra\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle for eDRX\_IDLE cycle upto 10.24 s for 1 Rx and 2 Rx RedCap UE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRX\_IDLE cycle length [s] | Scaling Factor (N1) | Tdetect,NR\_Intra\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tmeasure,NR\_Intra\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tevaluate,NR\_Intra\_RedCap\_Relax [s] (number of eDRX IDLE cycles) |
|  | FR1 | FR2Note1,2 |
| 2.56 | 1 | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| 5.12 | 117.76 x N1 x K1 (23 x N1 x K1) | 5.12 x N1 x K1 (1 x N1 x K1) | 10.24 x N1 x K1 (2 x N1 x K1) |
| 10.24 | 235.52 x N1 x K1 (23 x N1 x K1) | 10.24 x N1 x K1 (1 x N1 x K1) | 20.48 x N1 x K1 (2 x N1 x K1) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.Note 2: FR2 requirements are only applicable for 2 RX RedCap UE.Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion. |

Table 4.2B.2.9.10-x2: Tdetect,NR\_Intra\_RedCap\_Relax, Tmeasure,NR\_Intra\_RedCap\_elax and Tevaluate,NR\_Intra\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Tdetect,NR\_Intra\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,NR\_Intra\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,NR\_Intra\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥[3.84] ([3]) | $$eDRX\\_cycle\\_length×\left⌈\frac{23}{PTW/DRX\\_cycle\\_length}\right⌉x K1$$(23 x K1) | 0.32 x M2 x K1 (1 x M2 x K1) | 0.64 x M2 x K1 (2 x M2 x K1) |
| 0.64 | ≥[3.84] ([3]) | 0.64 x K1 (1 x K1) | 1.28 x K1 (2 x K1) |
| 1.28 | ≥[7.68] ([6]) | 1.28 x K1 (1 x K1) | 2.56 x K1 (2 x K1) |
| 2.56 | ≥[15.36] ([12]) | 2.56 x K1 (1 x K1) | 5.12 x K1 (2 x K1) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 3: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 4: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. Note 5: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion. |

Table 4.2B.2.9.10-x3: Tdetect,NR\_Intra\_RedCap\_Relax, Tmeasure,NR\_Intra\_RedCap\_Relax and Tevaluate,NR\_Intra\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Scaling Factor (N1)** Note1 | **Tdetect,NR\_Intra\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,NR\_Intra\_RedCap\_Relax** **[s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,NR\_Intra\_RedCap\_Relax****[s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥15.36 (12) | 8 | K1 x $eDRX\\_cycle\\_length×\left⌈\frac{23×N1}{PTW/DRX\\_cycle\\_length}\right⌉$(23 x N1 x K1) | 0.32 x N1 x K1 (1 x N1 x K1) | 0.64 x N1 x K1 (2 x N1 x K1) |
| 0.64 | ≥19.2 (15) | 5 | 0.64 x N1 x K1 (1 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) |
| 1.28 | ≥30.72 (24) | 4 | 1.28 x N1 x K1 (1 x N1 x K1) | 2.56 x N1 x K1 (2 x N1 x K1) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 3: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 4: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 5: The measurement shall not be performed across PTW’s. In this case the measurement is performed in the next available PTW.Note 6: The evaluation shall not be performed across PTW’s. In this case the evaluation is performed in the next available PTW.Note 7: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation criterion* [2]. |

* Recommended WF
	+ Check if option 1 is agreeable based on the conclusion of issue 1-2.

**Issue 1-2-6: eDRX inter-frequency requirements when meeting Rel-16 not-at-cell-edge mobility criterion for RedCap**

* Proposals
	+ Option 1 (MTK): The new requirements for eDRX with Rel-16 not-at-cell edge measurements relaxation for inter-frequency are given in tables 4.2B.2.10.10-x1, 4.2B.2.10.10-x2, and 4.2B.2.10.10-x3.

Table 4.2B.2.10.10-x1: Tdetect,NR\_Inter\_RedCap\_Relax, Tmeasure,NR\_Inter\_RedCap\_Relax and Tevaluate,NR\_Inter\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle for eDRX\_IDLE cycle upto 10.24 s for 1 Rx and 2 Rx RedCap UE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DRX\_IDLE cycle length [s] | Scaling Factor (N1) | Tdetect,NR\_Inter\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tmeasure,NR\_Inter\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tevaluate,NR\_Inter\_RedCap\_Relax [s] (number of eDRX IDLE cycles) |
|  | FR1 | FR2Note1,2 |
| 2.56 | 1 | 3 | 58.88 x N1 x K1 (23 x N1 x K1) | 2.56 x N1 x K1 (1 x K1) | 7.68 x N1 x K1 (3 x N1 x K1) |
| 5.12 | 117.76 x N1 x K1 (23 x N1 x K1) | 5.12 x N1 x K1 (1 x N1 x K1) | 10.24 x N1 x K1 (2 x N1 x K1) |
| 10.24 | 235.52 x N1 x K1 (23 x N1 x K1) | 10.24 x N1 x K1 (1 x N1 x K1) | 20.48 x N1 x K1 (2 x N1 x K1) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.Note 2: FR2 requirements are only applicable for 2 RX RedCap UE.Note 3: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion. |

Table 4.2B.2.10.10-x2: Tdetect,NR\_Inter\_RedCap\_Relax, Tmeasure,NR\_Inter\_RedCap\_elax and Tevaluate,NR\_Inter\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Tdetect,NR\_Inter\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,NR\_Inter\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,NR\_Inter\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥[3.84] ([3]) | $$eDRX\\_cycle\\_length×\left⌈\frac{23}{PTW/DRX\\_cycle\\_length}\right⌉x K1$$(23 x K1) | 0.32 x M2 x K1 (1 x M2 x K1) | 0.64 x M2 x K1 (2 x M2 x K1) |
| 0.64 | ≥[3.84] ([3]) | 0.64 x K1 (1 x K1) | 1.28 x K1 (2 x K1) |
| 1.28 | ≥[7.68] ([6]) | 1.28 x K1 (1 x K1) | 2.56 x K1 (2 x K1) |
| 2.56 | ≥[15.36] ([12]) | 2.56 x K1 (1 x K1) | 5.12 x K1 (2 x K1) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 3: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 4: M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms; otherwise M2=1. If different SMTC periodicities are configured for different cells, the SMTC periodicity in this note is the one used by the cell being identified. During PSS/SSS detection, the periodicity of the SMTC configured for the intra-frequency carrier is assumed, and if the actual SSB transmission periodicity is greater than the SMTC configured for the intra-frequency carrier, longer Tdetect, NR\_intra\_RedCap is expected.Note 5: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion. |

Table 4.2B.2.10.10-x3: Tdetect,NR\_Inter\_RedCap\_Relax, Tmeasure,NR\_Inter\_RedCap\_Relax and Tevaluate,NR\_Inter\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Scaling Factor (N1)** Note1 | **Tdetect,NR\_Inter\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,NR\_Inter\_RedCap\_Relax** **[s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,NR\_Inter\_RedCap\_Relax****[s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥15.36 (12) | 8 | K1 x $eDRX\\_cycle\\_length×\left⌈\frac{23×N1}{PTW/DRX\\_cycle\\_length}\right⌉$(23 x N1 x K1) | 0.32 x N1 x K1 (1 x N1 x K1) | 0.64 x N1 x K1 (2 x N1 x K1) |
| 0.64 | ≥19.2 (15) | 5 | 0.64 x N1 x K1 (1 x N1 x K1) | 1.28 x N1 x K1 (2 x N1 x K1) |
| 1.28 | ≥30.72 (24) | 4 | 1.28 x N1 x K1 (1 x N1 x K1) | 2.56 x N1 x K1 (2 x N1 x K1) |
| Note 1: Applies for RedCap UE of all supporting FR2 power classes.Note 2: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 3: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 4: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 5: The measurement shall not be performed across PTW’s. In this case the measurement is performed in the next available PTW.Note 6: The evaluation shall not be performed across PTW’s. In this case the evaluation is performed in the next available PTW.Note 7: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation criterion* [2]. |

* Recommended WF
	+ Check if option 1 is agreeable based on the conclusion of issue 1-2.

**Issue 1-2-7: eDRX inter-RAT (E-UTRAN) requirements when meeting Rel-16 not-at-cell-edge mobility criterion for RedCap**

* Proposals
	+ Option 1 (MTK): The new requirements for eDRX with Rel-16 not-at-cell edge measurements relaxation for EUTRAN are given in tables 4.2B.2.11.10-x1, and 4.2B.2.11.10-x2.

Table 4.2B.2.11.10-x1: Tdetect, EUTRAN\_RedCap\_Relax, Tmeasure, EUTRAN\_RedCap\_Relax and Tevaluate, EUTRAN\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle for eDRX\_IDLE cycle upto 10.24 s for 1 Rx and 2 Rx RedCap UE

|  |  |  |  |
| --- | --- | --- | --- |
| DRX\_IDLE cycle length [s] | Tdetect, EUTRAN\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tmeasure, EUTRAN\_RedCap\_Relax [s] (number of eDRX IDLE cycles) | Tevaluate, EUTRAN\_RedCap\_Relax [s] (number of eDRX IDLE cycles) |
|  |
| 5.12 | 117.76 x K1 (23 x K1) | 5.12 x K1 (1 x K1) | 10.24 x K1 (2 x K1) |
| 10.24 | 235.52 x K1 (23 x K1) | 10.24 x K1 (1 x K1) | 20.48 x K1 (2 x K1) |
| Note 1: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion. |

Table 4.2B.2.11.10-x2: Tdetect, EUTRAN\_RedCap\_Relax, Tmeasure, EUTRAN\_RedCap\_elax and Tevaluate, EUTRAN\_RedCap\_Relax for UE configured with eDRX\_IDLE cycle (Frequency range FR1)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **eDRX\_IDLE cycle length [s]** | **DRX cycle length [s]** | **PTW length [s] (number of 1.28s periods)** | **Tdetect, EUTRAN\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tmeasure,EUTRAN\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** | **Tevaluate,EUTRAN\_RedCap\_Relax [s] (number of DRX cycles or eDRX cycles Note 3)** |
| 20.48 ≤ eDRX\_IDLE cycle length ≤[163.84] | 0.32 | ≥[3.84] ([3]) | $$eDRX\\_cycle\\_length×\left⌈\frac{23}{PTW/DRX\\_cycle\\_length}\right⌉x K1$$(23 x K1) | 0.32 x K1 (1 x M2 x K1) | 0.64 x K1 (2 x M2 x K1) |
| 0.64 | ≥[3.84] ([3]) | 0.64 x K1 (1 x K1) | 1.28 x K1 (2 x K1) |
| 1.28 | ≥[7.68] ([6]) | 1.28 x K1 (1 x K1) | 2.56 x K1 (2 x K1) |
| 2.56 | ≥[15.36] ([12]) | 2.56 x K1 (1 x K1) | 5.12 x K1 (2 x K1) |
| Note 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.Note 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].Note 3: The lower bound of PTW length is derived based on $\left⌈\frac{Tevaluate,NR\\_Intra\\_RedCap\*DRX\\_cycle}{1.28}\right⌉\*1.28$.Note 4: K1 = 3 is the measurement relaxation factor applicable for UE fulfilling the *cellEdgeEvaluation* [2] criterion. |

* Recommended WF
	+ Check if option 1 is agreeable based on the conclusion of issue 1-2.

### Sub-topic 1-3 Mobility procedures with NCD-SSBs

*Sub-topic description:* Following agreement was reached at last meeting [R4-2220322]:

|  |
| --- |
| * + Agreement: For the case when the UE performs measurement on a SSB and handover to a BWP with un-measured SSB, the following apply:
* The requirements apply for the scenario where the measured SSB and the SSB in the target BWP for HO belong to the same target cell.
	+ Note: the above agreement is for RedCap, where the measured SSB and the target SSB for HO of the same target cell are:
		- NCD-SSB and NCD-SSB, respectively;
		- CD-SSB and NCD-SSB, respectively;
		- NCD-SSB and CD-SSB, respectively.
	+ Agreement:
* One additional sample is needed for known inter-frequency handover.
 |

*Open issues and candidate options before meeting:*

**Issue 1-3-1: Handover to a BWP with unmeasured SSB of a known cell**

* Proposals
	+ Option 1 (QC): Add condition on assumption on the TX power of the SSB of the target SSB and measured SSB as follows (underlined highlighted text is the addition to previous agreement).
		- For the case when the UE performs measurement on a SSB and handover to a BWP with un-measured SSB, the following apply:
			* The requirements apply for the scenario where the measured SSB and the SSB in the target BWP for HO belong to the same target cell, i.e., they share the same physCellID (PCI)
			* UE may assume that the TX power of the SSB of the target cell’s active BWP is same as that of the measured SSBs that belong to the same PCI
		- Note: the above agreement is for RedCap, where the measured SSB and the target SSB for HO of the same target cell are:
			* NCD-SSB and NCD-SSB, respectively
			* CD-SSB and NCD-SSB, respectively
			* NCD-SSB and CD-SSB, respectively
		- One additional sample is needed for known inter-frequency handover.
* Recommended WF
	+ Discuss the option.

**Issue 1-3-2: Revision of the intra/inter-frequency definition in handover**

* Proposals
	+ Option 1 (QC): Handover for a RedCap UE is defined as intra-frequency handover if the center frequency and subcarrier spacing (SCS) of the reference SSB of the serving cell is same as the center frequency and SCS of the reference SSB of the target cell, where:
		- The reference SSB of the serving cell is the SSB configured in the *BWP-specific* *servingCellMO*, if configured, else the SSB configured in the *servingCellMO*
		- The reference SSB of the target cell is the SSB configured in the *firstActiveBWP* of the target cell
* Recommended WF
	+ Discuss the option.

**Issue 1-3-3: Intra-frequency cell measurement**

* Proposals
	+ Option 1 (HW): UE is not required to perform intra-frequency cell detection if the intra-frequency cell is already detected, where an intra-frequency cell is regarded as already detected if it has been meeting the following conditions:

-The MO with the same SSB frequency has already be configured, and

-During 5s before BWP switching,

* the UE has sent a valid measurement report for the MO with the same frequency, and
* the SSB measured remains detectable according to the cee identification conditions specified in clause 9.2 and 9.3

* Recommended WF
	+ Discuss the option.

**Issue 1-3-4: Revision of the intra/inter-frequency definition in RRC re-establishment**

* Proposals
	+ Option 1 (QC): A neighbor cell for RRC re-establishment procedures for a RedCap UE is defined as an intra-frequency cell if the center frequency (and subcarrier spacing (SCS)) of the reference SSB of the serving cell is same as the center frequency (and SCS) of the reference SSB of the neighbor cell; else it is considered as inter-frequency cell, where:
		- The reference SSB of the target cell is the CD-SSB of the target cell
		- The reference SSB of the serving cell is
			* Option 1: SSB configured in the *BWP-specific* *servingCellMO*, if configured, else the SSB configured in the *servingCellMO*
			* Option 2: CD-SSB of the serving cell
			* Option 3: SSB within the active BWP
* Recommended WF
	+ Discuss the option.

**Issue 1-3-5: SMTC and MG collision**

**Background:** related to following issue which was discussed at 104#bis-e meeting with no agreement.

|  |
| --- |
| **Issue 3-1-1: Issue when NCD-SSB time offset = 5ms*** Proposals
	+ Option 1: RAN4 to consider sharing mechanism to define the measurement requirement when the NCD-SSB offset configured with 5ms. (xiaomi)
	+ Option 2: RAN4 to consider the scenario NCD-SSB time offset = 5ms and CD-SSB in a different BWP to NCD-SSB with MG for CD-SSB being applied. RAN4 to not further treat the scenario with NCD-SSB offset = 5ms, as there is no specification impact. Network can select appropriate MG configuration based on gap offset and MGTA to preclude UE having to drop MG assisted CD-SSB inter-frequency measurements. (Nokia)
	+ Option 3: In RedCap, RAN4 to define UE behaviour when the MG and the SMTC meets the proximity condition with the time distance = 4ms; When the SMTC for intra-frequency layer is fully-partially overlapping with the MG due to NCD-SSB offset, UE is required to perform intra-frequency measurement and drop the configured MG. (Ericsson)
	+ Option 4: Not necessary to consider this scenario (Huawei Apple Xiaomi oppo)

Agreements: No |

* Proposals
	+ Option 1 (ZTE):
		- RAN4 to consider the potential collision scenario when the NCD-SSB offset configured with 5ms.
		- The MG configuration selected by the network with the appropriate combination of gap offset and MGTA can solve the described collision problem.
* Recommended WF
	+ Option 1 suggests MG configuration selected by NW can solve the collision problem. Thus, no discussion needed.

### Sub-topic 1-4 Others

*Open issues and candidate options before meeting:*

**Issue 1-4-1: Inter-frequency cell reselection margin**

* Proposals
	+ Option 1 (HW): The condition of meeting inter-frequency cell reselection criteria shall be corrected:
		- for 1 Rx RedCap by a margin of at least 6 dB in FR1 for reselections based on ranking.
* Recommended WF
	+ Check if option 1 is agreeable.

CR:

**Recommendation for conflicting CRs for TS 38.133:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Tdoc** | **Company** | **Comments** | **Status** |
| R4-2301819/ R4-2303178 “Correction on measurement requirement in idle mode and connected mode for RedCap UE” | Huawei, HiSilicon | depends on the outcome of this issue. Alternatively, remove change 2 if above issue is not agreed.  | Return to |
| R4-2302123/ R4-2303179, “CR on NR RedCap measurement” | Ericsson | remove the changes related accuracy levels as captured in R4-2303178 (HW). | Return to |
| R4-2302127/ R4-2303181, “CR on NR RedCap measurement” | Ericsson |  | Return to |
| R4-2302129, “CR on NR RedCap HO” | Ericsson, Mediatek |  | Return to |
| R4-2302288/ R4-2303182, “Corrections to cell reselection, CG-SDT for RedCapR” | Nokia, Nokia Shanghai Bell |  | Return to |
| R4-2302314, “Formal CR to Rel-17 TS 38.133: on missing Rel-16 relaxation for RedCap IDLE mode” | MediaTek inc., Ericsson |  | Agreeable |
| R4-2302290, “Corrections to inter-frequency NR and inter-RAT E-UTRAN measurements for RedCap” | Nokia, Nokia Shanghai Bell | Remove the 4.2B.2.5 which is covered in R4-2301817 (HW) | Revise |
| R4-2302316/R4-2303183 (MTK), “Formal CR to Rel-17 TS 38.133: on RedCap maintenance in TS 38.133.”  | MediaTek inc. | Merged into Huawei’s CRs | Merged |
| “R4-2300276, “CR on NR RedCap measurement requirement in IDLE mode with eDRX R17”  | Apple |  | Revise |

# Topic #2: Performance part

Contributions from AI 5.2.5.3 are discussed here.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2302621 | Ericsson | Observation #1: RAN2 has recommended that the offset should not apply to delta thresholds, i.e. s-SearchDeltaP-r16 and s-SearchDeltaP-Stationary-r17.Observation #2: RAN2 has recommended that the offset should not apply to both cell selection thresholds (i.e. Qrxlevmin and Qqualmin) and not-at-cell-edge thresholds (i.e. s-SearchThresholdP-r16, s-SearchThresholdQ-r16, s-SearchThresholdP2-r17 and s-SearchThresholdQ2-r17).Observation #3: according to TS 38.133 currently, the offset is applied to both cell selection thresholds and to all the not-at-cell-edge thresholds.Proposal #1: Remove the offset from s-SearchDeltaP-r16 and s-SearchDeltaP-Stationary-r17.Proposal #2: Remove the offset from all not-at-cell-edge thresholds (i.e. s-SearchThresholdP-r16, s-SearchThresholdQ-r16, s-SearchThresholdP2-r17 and s-SearchThresholdQ2-r17.Observation #4: RAN2 has recommended that the offset is missing for the following thresholds: rsrp-ThresholdSSB-SUL and rsrp-ThresholdMsg3.Observation #5: The thresholds, rsrp-ThresholdSSB-SUL and rsrp-ThresholdMsg3, are absolute thresholds and applied by the UE during the random access procedure. Proposal #3: Add +1 dB of offset to ThresholdSSB-SUL and rsrp-ThresholdMsg3. |
| R4-2301199  | ZTE Corporation | Reply LS on configuring margin for 1 Rx RedCap UEs |
| R4-2300478 | Intel Corporation | Observation 1: It is reasonable to consider additional cell-specific RSRP thresholds for random access procedure: *rsrp-ThresholdSSB-SUL* and *rsrp-ThresholdMsg3.*Proposal 1: Specify the 1 Rx. offset in the relevant random access section of TS 38.133 RRM specifications regarding the cell-specific RSRP thresholds: *rsrp-ThresholdSSB-SUL* and *rsrp-ThresholdMsg3.*Observation 2: There is no double offset problem with SSearchDeltaP regardless of applying 1 Rx. offset to Qrxlevmin since the metric cares RSRP difference.Observation 3: For not-at-cell-edge criterion evaluation, the “ -1 dB” offset to *Qrxlevmin / Qqualmin* and “ +1 dB” offset to *s-SearchThresholdP/Q* are cancelled each other in the end. Proposal 2: RAN4 to consider the solutions including the options below,Option 1) Change 1 Rx. RedCap offset to *s-SearchThresholdP/Q-r16* and *s-SearchThresholdP2/Q2-r17* to “+ 2 dB”Option 2) Apply “0 dB” 1 Rx. RedCap offset to *Qrxlevmin* and *Qqualmin* Proposal 3: RAN4 to consider sending Reply LS to RAN2 capturing the observation 2 and 3 as well as the RAB4’s conclusion on proposal 2 with a draft in annex.  |
| R4-2300547 | CATT | Proposal 1: It is suggested that RAN4 further discuss with RAN2 on how to apply offset for the following Cell-specific RSRP thresholds, and if necessary, send the Reply LS to clarify RAN4's relevant considerations.* Delta thresholds (i.e. *s-SearchDeltaP-r16* and *s-SearchDeltaP-Stationary-r17*)
* Cell selection thresholds (i.e. *Qrxlevmin* and *Qqualmin*)

Not-at-cell-edge thresholds (i.e. *s-SearchThresholdP-r16*, *s-SearchThresholdQ-r16*, *s-SearchThresholdP2-r17* and *s-SearchThresholdQ2-r17*) |
| R4-2300915 | Xiaomi | Proposal 1: RAN4 to keep the current offset value determined in previous RAN4 meetings.Proposal 2: The offset of +1 dB should be applied for rsrp-ThresholdSSB-SUL and rsrp-ThresholdMsg3. |
| R4-2302296 | Nokia, Nokia Shanghai Bell | Proposal 1: Clarify in the Reply LS to RAN2, that the offset of -1 dB is appropriate for the delta thresholds s-SearchDeltaP-r16 and s-SearchDeltaP-Stationary-r17.Proposal 2: Clarify in the Reply LS to RAN2, that the offset of +1 dB is appropriate for the thresholds s-SearchThresholdP-r16 and s-SearchThresholdP2-r17 but will be removed from the thresholds s-SearchThresholdQ-r16 and s-SearchThresholdQ2-r17.Proposal 3: RAN4 not to consider an offset for rsrp-ThresholdSSB-SUL as this threshold is not applicable to RedCap UE’s. RAN4 to send this information to RAN2 in the Reply LS. Proposal 4: RAN4 to agree the offset of + 1dB for rsrp-ThresholdMsg3 in case of 1 Rx RedCap UE. RAN4 to send this information to RAN2 in the Reply LS.  |

## Open issues summary

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

### Sub-topic 2-1 Applying of offset

*Sub-topic description:* Issues related to the incoming LS from RAN2 [R4-2300016] regarding the offset for cell specific RSRP thresholds for 1 Rx RedCap UE.

*Open issues and candidate options before meeting:*

**Issue 2-1-1: Offset for low mobility and stationary relaxed measurement criteria thresholds**

* Proposals
	+ Option 1(E///, ZTE): Remove the offset from s-SearchDeltaP-r16 and s-SearchDeltaP-Stationary-r17.
	+ Option 2 (Xiaomi, Nokia): RAN4 to keep the current offset value determined in previous RAN4 meetings.
* Recommended WF
	+ Confirm whether option 1 is agreeable.

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| **Online session (Monday / Feb 27th)*** Agreements
	+ Remove the offset from s-SearchDeltaP-r16 and s-SearchDeltaP-Stationary-r17.
 |

**Issue 2-1-2: Offset for cell selection and not-at-cell-edge criteria thresholds**

Background: Not-at-cell-edge thresholds *are s-SearchThresholdP-r16, s-SearchThresholdQ-r16, s-SearchThresholdP2-r17* and s-*SearchThresholdQ2-r17*.

* Proposals
	+ Option 1(E///): Remove the offset from all not-at-cell-edge thresholds.
	+ Option 2(Xiaomi): RAN4 to keep the current offset value determined in previous RAN4 meetings.
		- Option 2a(Intel): Keep the offset and change it to +2dB for all not-at-cell-edge thresholds.
	+ Option 3(Nokia):
		- Keep current RAN4 agreed offsets for *SearchThresholdP-r16* and *s-SearchThresholdP2-r17*
		- Remove the offset from the thresholds *SearchThresholdQ-r16* and *s-SearchThresholdQ2-r17*.
	+ Option 4 (Intel): Apply “0 dB” 1 Rx. RedCap offset to *Qrxlevmin* and *Qqualmin*

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| **Online session (Monday / Feb 27th)*** Discussion
	+ MTK: support Option 1
	+ Huawei: RAN2 will address this problem (Option 2)
	+ QC: Based on current equations the offsets cancel out each other. Ok with Option 1.
	+ Vivo: Option 2
 |

* Recommended WF

Given that RAN4 has agreed to remove the offset from the stationary and low mobility thresholds (**Issue 2-1-1**), it is suggested to apply the same agreement for not-at-cell-edge criterion thresholds.

**Issue 2-1-3: Offset for missing thresholds:** *rsrp-ThresholdSSB-SUL*

* Proposals
	+ Option 1(E///, ZTE, Intel): Add +1 dB of offset to *rsrp-ThresholdSSB-SUL*.
	+ Option 2 (Nokia): not to consider an offset for *rsrp-ThresholdSSB-SUL* as this threshold is not applicable to RedCap UE’s.
* Recommended WF
	+ Discuss the options.

**Issue 2-1-4: Offset for missing thresholds:** *rsrp-ThresholdMsg3*

* Proposals
	+ Option 1(E///, ZTE, Intel, Nokia): Add +1 dB of offset to *rsrp-ThresholdMsg3*.
* Recommended WF
	+ Tentative agreement: Add +1 dB of offset to *rsrp-ThresholdMsg3.*

**Issue 2-1-5: LS to RAN2**

* Proposals
	+ Option 1(ZTE, Intel, Nokia): RAN4 to send inform RAN2 about RAN4 agreements.
		- One draft is draft provided in R4-2301199.
* Recommended WF
	+ Depends on the conclusion of 2-1-1, 2-1-2, 2-1-3 and 2-1-4. If the RAN4 agreements for these issues are aligned with the RAN2 reply LS in R2-2213069, moderator sees no need to send LS. Otherwise if RAN4 agreements are not aligned with the RAN2 reply LS, consider sending a LS.

**Recommendation for conflicting CRs for TS 38.133:**

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| **Tdoc** | **Company** | **Status** |
| R4-2302622, “Correction to offset for cell specific RSRP thresholds for 1Rx Redcap UE in 38.133” | Ericsson | Revised or return to based on the outcome of discussions |
| R4-2301290, “CR for margin for 1 Rx RedCap UEs” | Vivo | Merged  |
|  |  |  |

**LS out:**

* Whether to revise R4-2301199 (ZTE) “Reply LS on configuring margin for 1 Rx RedCap UEs” depends on the conclusion of issues the above issues. If RAN4 agreements are aligned, then no need to send LS.