**3GPP TSG-RAN WG4 Meeting # 102-e R4-2206974**

**Electronic Meeting, 21 Feb. – 04 March, 2022**

**Agenda item:** 10.20.3.2; 10.20.3.3; 10.20.3.4

**Source:** vivo

**Title:** WF on eDRX and RRM measurement relaxations requirements for Redcap UE

**Document for:** Approval

# Introduction

This is the WF to capture all agreements and open issues in [102][229] NR\_redcap\_RRM\_2 email related to eDRX and RRM measurement relaxations requirements for Redcap UE discussion at RAN4#102-e meeting.

# Topic #1: Extended DRX enhancements

### Sub-topic 1-1 General aspects on eDRX enhancements

### Sub-topic 1-2 Idle state serving cell eDRX requirements

**Issue 1-2-1: Nserv and N1 for eDRX length up to 10.24s (FR2)**

Moderator Note: The following is used for Nserv (FR2) requirement based on R4-2202672. The left issue is N1 value.

|  |  |  |
| --- | --- | --- |
| *eDRX cycle length [s]* | *FR2 Scaling Factor (N1)* | *Nserv [number of eDRX cycles]* |
| ***2.56*** | ***[TBD]*** | ***N1\*2*** |
| ***5.12*** |
| ***10.24*** |

Option 1: N1 = 3 for eDRX = 5.12 and 10.24s. (CMCC Nokia Ericsson Huawei xiaomi vivo)

Agreement: agree with N1 = 3 for eDRX = 5.12 and 10.24s for FR2 Nserv requirements

**Issue 1-2-2: Serving cell requirements for eDRX length larger than 10.24s**

* Option 1: (Apple oppo vivo)
  + Option 1a: Only support requirements in option 1 for FR1 (MTK)

***FR1 Nserv for 10.24s<eDRX cycle≤10485.76s***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *eDRX cycle length [s]* | *DRX cycle length [s]* | *PTW length [s]*  *(number of 1.28s periods)* | *Scaling Factor (N1) for FR1* | *Nserv [number of DRX cycles]* |
| ***20.48 ≤ eDRX\_IDLE cycle length ≤ 10485.76*** | ***0.32*** | ***≥ 1.28 (1) (M1=2)*** | ***1*** | ***M1\*N1\*2*** |
| ***0.64*** | ***≥ 2.56 (2) (M1=2)*** | ***M1\* N1\*2*** |
| ***1.28*** | ***≥ 2.56 (2)*** | ***N1\*2*** |
| ***2.56*** | ***≥ 5.12 (4)*** | ***N1\*2*** |
| ***Note 1: PTW length is derived based on***  ***Note 2: M1=2 if SMTC periodicity (TSMTC) > 20 ms and DRX cycle≤ 0.64s, otherwise M1=1.*** | | | | |

***FR2 Nserv for 10.24s<eDRX cycle≤10485.76s***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *eDRX cycle length [s]* | *DRX cycle length [s]* | *PTW length [s]*  *(number of 1.28s periods)* | *Scaling Factor (N1) for FR2* | *Nserv [number of DRX cycles]* |
| ***20.48 ≤ eDRX\_IDLE cycle length ≤ 10485.76*** | ***0.32*** | ***≥ 5.12 (4)*** | ***8*** | ***N1\*2*** |
| ***0.64*** | ***≥ 6.4 (5)*** | ***5*** | ***N1\*2*** |
| ***1.28*** | ***≥ 10.24 (8)*** | ***4*** | ***N1\*2*** |
| ***2.56*** | ***≥ 15.36 (12)*** | ***3*** | ***N1\*2*** |
| ***Note 1: PTW length is derived based on*** | | | | |

**Tentative agreement: the following table are agreed:**

***FR1 Nserv for 10.24s<eDRX cycle≤10485.76s***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *eDRX cycle length [s]* | *DRX cycle length [s]* | *PTW length [s]*  *(number of 1.28s periods)* | *Scaling Factor (N1) for FR1* | *Nserv [number of DRX cycles]* |
| ***20.48 ≤ eDRX\_IDLE cycle length ≤ 10485.76*** | ***0.32*** | ***≥ 1.28 (1)*** | ***1*** | ***M1\*N1\*2*** |
| ***0.64*** | ***≥ 1.28 (1) (M1=1) or ≥ 2.56 (2) (M1=2)*** | ***M1\* N1\*2*** |
| ***1.28*** | ***≥ 2.56 (2)*** | ***N1\*2*** |
| ***2.56*** | ***≥ 5.12 (4)*** | ***N1\*2*** |
| ***Note 1: PTW length is derived based on***  ***Note 2: M1=2 if SMTC periodicity (TSMTC) > 20 ms and DRX cycle≤ 0.64s, otherwise M1=1.*** | | | | |

***FR2 Nserv for 10.24s<eDRX cycle≤10485.76s***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *eDRX cycle length [s]* | *DRX cycle length [s]* | *PTW length [s]*  *(number of 1.28s periods)* | *Scaling Factor (N1) for FR2* | *Nserv [number of DRX cycles]* |
| ***20.48 ≤ eDRX\_IDLE cycle length ≤ 10485.76*** | ***0.32*** | ***≥ 5.12 (4)*** | ***8*** | ***N1\*2*** |
| ***0.64*** | ***≥ 6.4 (5)*** | ***5*** | ***N1\*2*** |
| ***1.28*** | ***≥ 10.24 (8)*** | ***4*** | ***N1\*2*** |
| ***2.56*** | ***≥ 15.36 (12)*** | ***3*** | ***N1\*2*** |
| ***Note 1: PTW length is derived based on*** | | | | |

**Issue 1-2-2-1: FR1 PTW length (N1=1), whether M1 should be considered for FR1/FR2 Nserv when DRX = 0.32 and 0.64s**

* Option 1: Keep M1 (M1=2 if SMTC periodicity (TSMTC) > 20 ms and DRX cycle≤ 0.64s) (Apple MTK vivo)
* Option 2: Do not use M1(CMCC Nokia Ericsson ZTE)
* Option 3: Keep M1 for FR1 and do not use M1 for FR2 (Huawei)

Agreement: Keep M1 for FR1 and do not use M1 for FR2

**Issue 1-2-2-2: N1 for FR2 Nserv requirements**

Option 1: N1= 8 for DRX= 0.32s; 5 for DRX=0.64s; 4 for DRX= 1.28s; 3 for DRX =2.56s (Apple CMCC Nokia Ericsson Huawei xiaomi vivo)

Agreement: option 1

**Issue 1-2-2-3: FR2 serving cell requirements for RedCap UE with eDRX cycle when eDRX = 20.48s (and 40.96s)**

* Option 1: The eDRX cycles with PTW (20.48s and 40.96s) are not feasible. Besdies, three more eDRX cycles with PTE are overlapped with eDRX without PTW. RAN4 shall keep eDRX for FR2 requirements as FFS and inform RAN2 with update on the issues related to eDRX with FR2 (MTK)
* Option 1a: Can we add Option 1a: add a note to exclude the case of eDRX 20.48s with DRX 0.32s in FR2?   
  To our understanding, the above option is not feasible and we can compromise to it. (MTK)
* Option 2: Not agree with option 1 (Ericsson, Huawei, xiaomi, vivo, Nokia)

Tentative agreement: agree option 2 with the case (eDRX cycle = 20.48s and DRX cycle = 0.32s) for FFS

### Sub-topic 1-3 Idle state cell reselection eDRX requirements

**Issue 1-3-1: FR1 Cell reselection requirements for RedCap UE with eDRX cycle (intra frequency) when eDRX ≤10.24s**

* Option 1 (**Apple MTK Ericsson**)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *eDRX cycle length [s]* | *Scaling Factor (N1) FR1* | *Tdetect,NR\_Intra [s] (number of eDRX cycles)* | *Tmeasure,NR\_Intra [s] (number of eDRX cycles)* | *Tevaluate,NR\_Intra*  *[s] (number of eDRX cycles)* |
| ***2.56*** | ***1*** | ***58.88 x N1 (23 x N1)*** | ***2.56 x N1 (1 x N1)*** | ***7.68 x N1 (3 x N1)*** |
| ***5.12*** | ***102.4 x N1 (20 x N1)*** | ***5.12 x N1 (1 x N1)*** | ***10.24 x N1 (2 x N1)*** |
| ***10.24*** | ***102.4 x N1 (10 x N1)*** | ***10.24 x N1 (1 x N1)*** | ***20.48 x N1 (2 x N1)*** |

* Option 2 (**Huawei Apple CMCC xiaomi oppo vivo MTK Nokia QC**)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| eDRX cycle length [s] | Scaling Factor (N1) FR1 | Tdetect,NR\_Intra [s] (number of eDRX cycles) | Tmeasure,NR\_Intra [s] (number of eDRX cycles) | Tevaluate,NR\_Intra  [s] (number of eDRX cycles) |
| 2.56 | 1 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| 5.12 | 117.76 x N1 (23 x N1) | 5.12 x N1 (1 x N1) | 10.24 x N1 (2 x N1) |
| 10.24 | 235.52 x N1 (23 x N1) | 10.24 x N1 (1 x N1) | 20.48 x N1 (2 x N1) |

* Option 3 (**Xiaomi**)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| eDRX cycle length [s] | Scaling Factor (N1) FR1 | Tdetect,NR\_Intra [s] (number of eDRX cycles) | Tmeasure,NR\_Intra [s] (number of eDRX cycles) | Tevaluate,NR\_Intra  [s] (number of eDRX cycles) |
| 2.56 | 1 | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 5.12 x N1 (2 x N1) |
| 5.12 | 117.76 x N1 (23 x N1) | 5.12 x N1 (1 x N1) | 10.24 x N1 (2 x N1) |
| 10.24 | 235.52 x N1 (23 x N1) | 10.24 x N1 (1 x N1) | 20.48 x N1 (2 x N1) |

Agreement: agree option 2.

**Issue 1-3-2: FR2 Cell reselection requirements for RedCap UE with eDRX cycle (intra frequency) when eDRX ≤10.24s**

**Option 1 (Apple MTK Ericsson)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *eDRX cycle length [s]* | *FR2 Scaling Factor (N1)* | *Tdetect,NR\_Intra [s] (number of eDRX cycles)* | *Tmeasure,NR\_Intra [s] (number of eDRX cycles)* | *Tevaluate,NR\_Intra*  *[s] (number of eDRX cycles)* |
| ***2.56*** | ***3*** | ***58.88 x N1 (23 x N1)*** | ***2.56 x N1 (1 x N1)*** | ***7.68 x N1 (3 x N1)*** |
| ***5.12*** | ***102.4 x N1 (20 x N1)*** | ***5.12 x N1 (1 x N1)*** | ***10.24 x N1 (2 x N1)*** |
| ***10.24*** | ***102.4 x N1 (10 x N1)*** | ***10.24 x N1 (1 x N1)*** | ***20.48 x N1 (2 x N1)*** |

**Option 2 (Huawei Apple CMCC xiaomi oppo vivo MTK Nokia QC)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **eDRX cycle length [s]** | **Scaling Factor (N1)** | **Tdetect,NR\_Intra [s] (number of eDRX cycles)** | **Tmeasure,NR\_Intra [s] (number of eDRX cycles)** | **Tevaluate,NR\_Intra**  **[s] (number of eDRX cycles)** |
| 2.56 |  | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 7.68 x N1 (3 x N1) |
| 5.12 | 3 | 117.76 x N1 (23 x N1) | 5.12 x N1 (1 x N1) | 10.24 x N1 (2 x N1) |
| 10.24 |  | 235.52 x N1 (23 x N1) | 10.24 x N1 (1 x N1) | 20.48 x N1 (2 x N1) |

**Option 3 (Xiaomi)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **eDRX cycle length [s]** | **Scaling Factor (N1)** | **Tdetect,NR\_Intra [s] (number of eDRX cycles)** | **Tmeasure,NR\_Intra [s] (number of eDRX cycles)** | **Tevaluate,NR\_Intra**  **[s] (number of eDRX cycles)** |
| 2.56 |  | 58.88 x N1 (23 x N1) | 2.56 x N1 (1 x N1) | 5.12 x N1 (2 x N1) |
| 5.12 | 3 | 117.76 x N1 (23 x N1) | 5.12 x N1 (1 x N1) | 10.24 x N1 (2 x N1) |
| 10.24 |  | 235.52 x N1 (23 x N1) | 10.24 x N1 (1 x N1) | 20.48 x N1 (2 x N1) |

Agreement: agree option 2.

**Issue 1-3-3: FR1 Cell reselection requirements for RedCap UE with eDRX cycle (intra frequency) when eDRX >10.24s**

* Option 1 (Apple MTK)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *eDRX cycle length [s]* | *DRX cycle length [s]* | *PTW length [s]*  *(number of 1.28s periods)* | *FR1 Scaling Factor (N1)* | *Tdetect,NR\_Intra [s] (number of DRX cycles)* | *Tmeasure,NR\_Intra [s] (number of DRX cycles)* | *Tevaluate,NR\_Intra*  *[s] (number of DRX cycles)* |
| ***20.48 ≤ eDRX\_IDLE cycle length ≤ 10485.76*** | ***0.32*** | ***≥ 1.28 (1)*** | ***1*** |  | ***0.32 x N1 x M2 (1 x N1 x M2)*** | ***0.64 x N1 x M2 (2 x N1 x M2)*** |
| ***0.64*** | ***≥ 1.28 (1)*** | ***0.64 x N1 (1 x N1)*** | ***1.28 x N1 (2 x N1)*** |
| ***1.28*** | ***≥ 2.56 (2)*** | ***1.28 x N1 (1 x N1)*** | ***2.56 x N1 (2 x N1)*** |
| ***2.56*** | ***≥ 5.12 (4)*** | ***2.56 x N1 (1 x N1)*** | ***5.12 x N1 (2 x N1)*** |
| ***Note 1: PTW length is derived based on***  ***Note 2: M2=1.5 if SMTC periodicity of measured intra-frequency cell > 20 m and DRX cycle=0.32s, otherwise M2=1.*** | | | | | | |

* Option 2 (vivo)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *eDRX cycle length [s]* | *DRX cycle length [s]* | *PTW length [s]*  *(number of 1.28s periods)* | *FR1 Scaling Factor (N1)* | *Tdetect,NR\_Intra [s] (number of DRX cycles)* | *Tmeasure,NR\_Intra [s] (number of DRX cycles)* | *Tevaluate,NR\_Intra*  *[s] (number of DRX cycles)* |
| ***20.48 ≤ eDRX\_IDLE cycle length ≤ 10485.76*** | ***0.32*** | ***≥1.28\*M2 (1\*M2)*** | ***1*** | ***(23)*** | ***0.32 x N1\*M2 (1 x N1\*M2)*** | ***0.64 x N1 \*M2 (2 x N1\*M2)*** |
| ***0.64*** | ***≥1.28 (1)*** | ***0.64 x N1 (1 x N1)*** | ***1.28 x N1 (2 x N1)*** |
| ***1.28*** | ***≥2.56 (2)*** | ***1.28 x N1 (1 x N1)*** | ***2.56 x N1 (2 x N1)*** |
| ***2.56*** | ***≥5.12 (4)*** | ***2.56 x N1 (1 x N1)*** | ***5.12 x N1 (2 x N1)*** |

Tentative agreement: option 1

**Issue 1-3-3-1 Whether to consider M2 when DRX = 0.32s**

* Option 1 included (M2 = 1.5 if SMTC periodicity of measured intra-frequency cell > 20 ms, otherwise M2=1.(Apple Huawei MTK vivo)
* Option 2: Do not include M2 (CMCC Nokia Ericsson ZTE)

Agreement: Keep M2 for FR1 and do not use M2 for FR2

**Issue 1-3-3-2 Whether split PTW to 2 gears for small DRX cycle (0.32s and 0.64s) when defining requirements**

* Option 1: Yes (Huawei)
* Option 2: No (Apple CMCC Nokia Ericsson)

Agreement: option 2

**Issue 1-3-4: FR2 Cell reselection requirements for RedCap UE with eDRX cycle (intra frequency) when eDRX ≥20.48s**

* Option 2a (Ericsson)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| eDRX cycle length [s] | DRX cycle length [s] | PTW length [s]  (number of 1.28s periods) | FR2 Scaling Factor (N1) | Tdetect,NR\_Intra [s] (number of DRX cycles) | Tmeasure,NR\_Intra [s] (number of DRX cycles) | Tevaluate,NR\_Intra  [s] (number of DRX cycles) |
| 20.48 ≤ eDRX\_IDLE cycle length ≤ 10485.76 | 0.32 | ≥ 5.12 (4) | 8 | (23) | 0.32 x N1  (1 x N1) | 0.64 x N1  (2 x N1) |
| 0.64 | ≥ 6.4 (5) | 5 | 0.64 x N1  (1 x N1) | 1.28 x N1  (2 x N1) |
| 1.28 | ≥ 10.24 (8) | 4 | 1.28 x N1  (1 x N1) | 2.56 x N1  (2 x N1) |
| 2.56 | ≥ 15.36 (12) | 3 | 2.56 x N1  (1 x N1) | 5.12 x N1  (2 x N1) |

Tentative agreement: requirements in the following table are agreed:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| eDRX cycle length [s] | DRX cycle length [s] | PTW length [s]  (number of 1.28s periods) | FR2 Scaling Factor (N1) | Tdetect,NR\_Intra [s] (number of DRX cycles) | Tmeasure,NR\_Intra [s] (number of DRX cycles) | Tevaluate,NR\_Intra  [s] (number of DRX cycles) |
| 20.48 ≤ eDRX\_IDLE cycle length ≤ 10485.76 | 0.32 | ≥ 5.12 (4) | 8 | (23) | 0.32 x N1  (1 x N1) | 0.64 x N1  (2 x N1) |
| 0.64 | ≥ 6.4 (5) | 5 | 0.64 x N1  (1 x N1) | 1.28 x N1  (2 x N1) |
| 1.28 | ≥ 10.24 (8) | 4 | 1.28 x N1  (1 x N1) | 2.56 x N1  (2 x N1) |
| 2.56 | ≥ 15.36 (12) | 3 | 2.56 x N1  (1 x N1) | 5.12 x N1  (2 x N1) |
| Note 1: PTW length is derived based on | | | | | | |

**Issue 1-3-4-1: FR2 Cell reselection requirements for RedCap UE with eDRX cycle (intra frequency) when eDRX = 20.48s (and 40.96s)**

* Option 1: The eDRX cycles with PTW (20.48s and 40.96s) are not feasible. RAN4 shall keep eDRX for FR2 requirements as FFS and inform RAN2 with update on the issues related to eDRX with FR2 (MTK)
* Option 2: No issue (Apple CMCC Nokia Ericsson Huawei vivo xiaomi oppo)

Tentative agreement: Agree option 2 with the case (eDRX cycle = 20.48s and DRX cycle = 0.32s) for FFS

**Issue 1-3-4-2: N1 for FR2 intra-frequency cell reselection requirements**

* Option 1: [8 5 4 3] for DRX [0.32 0.64 1.28 2.56] (Apple CMCC Nokia Ericsson Huawei xiaomi vivo)

Agreement: option 1

**Issue 1-3-5 Timer for initiating Cell selection in Idle mode**

* Proposals
* Option 1: (Ericsson)
  + When UE is configured with eDRX\_IDLE cycle, introduce the max function for timer T = max(10s, one eDRX\_IDLE cycle) in FR1 for initiating the cell selection;
  + When UE is configured with eDRX\_IDLE cycle, introduce the max function for timer T = max(10s, K1\*N1\*eDRX\_IDLE cycle) in FR2 for initiating the cell selection when eDRX cycle is less than 20.48s, where, K1=2. Otherwise, T = max(81.92s, one eDRX\_IDLE cycle
* Option 2 (Huawei Apple vivo Nokia)
  + When UE is configured with eDRX\_IDLE cycle, introduce the max function for timer T = max(10s, one eDRX\_IDLE cycle) in FR1 for initiating the cell selection;
  + When UE is configured with eDRX\_IDLE cycle, introduce the max function for timer T= max(10s, N1\*eDRX cycle) in FR2 for initiating the cell selection when eDRX cycle is less than 20.48s
* Option 2a
  + When UE is configured with eDRX\_IDLE cycle, introduce the max function for timer T = max(10s, one eDRX\_IDLE cycle) in FR1 for initiating the cell selection;
  + When UE is configured with eDRX\_IDLE cycle, introduce the max function for timer T= max(10s, N1\*eDRX cycle) in FR2 for initiating the cell selection when eDRX cycle is less than 20.48s
  + When UE is configured with eDRX\_IDLE cycle, introduce the max function for timer T= max(10s, eDRX cycle) in FR2 for initiating the cell selection when eDRX cycle is larger than 10.24s
* Option 3 (MTK)
  + When UE is configured with eDRX\_IDLE cycle, introduce the max function for timer T = max(10s, one eDRX\_IDLE cycle) in FR1 for initiating the cell selection;
  + FFS on FR2

Tentative agreement: option 2a

### Sub-topic 1-4 eDRX requirements for inactive state

**Issue 1-4-1: Inactive state requirements when idle eDRX is longer than 10.24s**

* + Option 1: The inactive UE requirements are based on inactive DRX or inactive eDRX when inactive eDRX is configured (Huawei vivo MTK)
  + Option 2: Based on the paging monitoring cycle of T agreed in RAN2 (Apple Ericsson xiaomi Nokia)

|  |  |  |  |
| --- | --- | --- | --- |
| IDLE eDRX[s] | Inactive eDRX[s] | Outside CN PTW or during CN PTW | T |
| >10.24 | Not configured | During CN PTW | Shortest value of default paging cycle and UE specific DRX cycle if configured by upper layer |
| >10.24 | Not configured | Outside CN PTW | RAN paging cycle. |
| >10.24 | ≤10.24 | During CN PTW | Shortest value of default paging cycle and UE specific DRX cycle if configured by upper layer |
| >10.24 | ≤10.24 | Outside CN PTW | INACTIVE eDRX cycle |

Tentative agreement: no consensus

**Issue 1-4-2: Inactive state requirements when idle eDRX is no longer than 10.24s**

* + Option 1: The inactive UE requirements are based on inactive eDRX or inactive DRX when inactive eDRX is not configured (Huawei vivo MTK)
  + Option 2: Based on the paging monitoring cycle of T agreed in RAN2 (Apple Ericsson xiaomi vivo Nokia)

|  |  |  |  |
| --- | --- | --- | --- |
| IDLE eDRX[s] | Inactive eDRX[s] | Outside CN PTW or during CN PTW | T |
| ≤10.24 | Not configured | NA | Shortest of RAN paging cycle and IDLE eDRX cycle |
| ≤10.24 | ≤10.24 | NA | The shortest of IDLE eDRX cycle and INACTIVE eDRX cycle. |

Tentative agreement: No consensus, FFS at maintenance stage

**Issue 1-4-4: Inactive state eDRX inter-frequency requirements**

* + Option 1: The inter-frequency measurement requirements for inactive state Redcap UE are the same as these of intra-frequency measurement requirements (vivo)

**Agreement: option 1**

# Topic #2: RRM measurement relaxations

### Sub-topic 2-1 General aspects for RRM measurement relaxation for Redcap

**Issue 2-1-1: Scenario to be considered for Rel-17 RRM relaxation for Redcap when both Rel-16 and Rel-17 criteria are configured agreed at RAN4 101bis-e**

**Moderator Note: update case number to align with agreed LS R4-2202675**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Rel-16 relaxation criterion** | **Rel-17 relaxation criterion** | **Applicability** |
| 7 | Rel-16 low mobility | Rel-17 stationary | Allowed |
| 8 | Rel-16 not-at-cell-edge | Rel-17 stationary | NO |
| 9 | Rel-16 low mobility & Rel-16 not-at-cell-edge | Rel-17 stationary | * Option 1: Not allowed(Huawei Apple CMCC xiaomi oppo Nokia vivo) * Option 2: Allowed (xiaomi MTK QC) |
| 10 | Rel-16 low-mobility | Rel-17 stationary & Rel-17 not-at-cell-edge | Allowed |
| 11 | Rel-16 not-at-cell-edge | Rel-17 stationary & Rel-17 not-at-cell-edge | * Option 1: Allowed (Apple xiaomi Huawei Nokia vivo) |
| 12 | Rel-16 low mobility & Rel-16 not-at-cell-edge | Rel-17 stationary & Rel-17 not-at-cell-edge | * Option 1: Allowed (Apple xiaomi Huawei Nokia vivo) |

Agreement: case 11 and 12 are allowed

Tentative agreement: No

**Issue 2-1-2: Relaxation when multiple criteria of Rel-16 and Rel-17 are satisfied**

* Proposals
  + Option 1: UE is allowed to meet the requirements that are most relaxed out of Rel-16 and Rel-17 requirements. (ZTE Apple CMCC Ericsson Nokia vivo)
  + Option 2: Up to UE implementation (ZTE xiaomi oppo Huawei)
  + Option 3: The UE shall perform Rel-17 RRM relaxation method (MTK )
    - Option 3a: A note shall be added to the rel-17 RRM relaxation to mention that when rel-17 RRM relaxation criterion is fulfilled then the rel-16 RRM relaxation shall be disabled (MTK)

GTW agreement: UE is allowed to meet the requirements that are the most relaxed out of Rel-16 and Rel-17 requirements

**Issue 2-1-3 Requirements for transition when UE moves between different R17 states**

* Proposals
  + Option 1: No need to introduce transition requirements for relaxed measurements for switching between IDLE/INACTIVE and CONNECTED states (Ericsson)
* Recommended WF
  + postpone the discussion until conclusion on RRM relaxation for CONNECTED state are clear

Agreement: no more discussion at 2nd round

### Sub-topic 2-2 RRM measurement relaxation for Redcap at Idle/Inactive state

**Issue 2-2-1: Scaling factor value when Rel-17 single criteria (stationary) is satisfied**

* Proposals
  + Option 1: 8 (Apple)
  + Option 2: 4 (Ericsson Huawei CMCC)
  + Option 3: 6 (oppo Nokia vivo Apple xiaomi MTK Nokia QC)

Tentative agreement: option 3

**Issue 2-2-2: The value of the one fixed long measurement period when both Rel-17 criteria are satisfied**

* Proposals
  + Option 1: 8 hours (Apple MTK xiaomi QC)
  + Option 2: 2 hours (Huawei CMCC Ericsson Nokia)
  + Option 3: 4 hours (vivo Apple xiaomi oppo)
  + Option 4: 3 hours (Nokia)

Tentative agreement: No consensus

**Issue 2-2-3: Principle on RRM relaxation under eDRX**

* Proposals
  + Option 1: The relaxed RRM measurement period for PHY filtering shall not cross different PTW windows. (Apple)
  + Option 2a: Rel-16/17 relaxed measurement requirements can be applied with eDRX cycles up to 10.24 seconds, without any PTW; （Huawei vivo Nokia）
    - Option 2a-1: UE shall meet the requirements where corresponding scaling factor of RRM relaxation applies on top of eDRX requirements when particular RRM criteria is satisfied. .
    - Option 2a-2: Other options.
  + Option 2b: If relaxation is supported for eDRX cycles above 10.24 seconds, discuss the maximum eDRX cycles (X) with PTW up to which UE is allowed to apply Rel-16/17 relaxed measurement requirements is X ms, where value of X is FFS. (Ericsson)

Moderator Note: Option 1, option 2a and option 2b are not exclusive each other.

Tentative agreement: Option 2a and Option 2a-1 are agreed. FFS on option 1 at maintenance stage.

**Issue 2-2-4: Inter-frequency measurement Relaxation when only Rel-17 stationarity criterion is met and Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ**

* Proposals:
  + - Option 1: wait for RAN2’s reply LS is (Ericsson Nokia)
* Recommended WF
* Wait for RAN2 reply LS

Agreement: wait for RAN2 LS and no more discussion at this meeting.

### Sub-topic 2-3 RRM measurement relaxation for Redcap at CONNECTED state

**Issue 2-3-1: On RRM relaxation criteria for RRC\_CONNECTED mode**

* Proposals
  + Option 1: only consider scenario 4 (Rel-17 stationary configured alone) of the idle state scenario list in Connected state.(Apple Nokia vivo)
  + Option 3: no relaxation states in CONNECTED mode (Ericsson Huawei CMCC Apple)

Tentative agreement: Suggest to agree Option 3

**Issue 2-3-2: On RRM relaxation principles for RRC\_CONNECTED mode**

* Proposals
  + Option 1: The relaxation method of stationary criterion for idle/inactive mode could be used as baseline for connected mode UE (Nokia vivo)
    - Option 1a: the UE applies the same relaxation method as in Idle / Inactive state in case the stationary criterion only is satisfied, i.e. the scaling/relaxation factor-based NC measurement relaxation using the scaling/relaxation factor received via dedicated signalling. (Nokia)
  + Option 2: No new UE behaviour of RRM measurement relaxation is needed for RedCap UE in connected mode (Huawei CMCC Ericsson MTK Apple xiaomi oppo QC)
    - Option 2a: how to define new relaxation methods for RedCap UE up to RAN2 decision (xiaomi)

Tentative agreement: Option 2 is agreed.

**Issue 2-3-3 On how to evaluate RRM relaxation criteria at RRC\_CONNECTED mode**

* Proposals
  + Option 1: No new UE behaviour/requirements are needed on how to evaluate RRM relaxation criteria at RRC\_CONNECTED mode (Huawei CMCC Apple xiaomi vivo)
  + Option 2: Evaluation period on the configured relaxation criteria is configured by NW at CONNECTED mode; (Nokia)
    - Option 2b: The evaluation period covers scaling factors lower or equal to that for RRC\_Idle / RRC\_Inactive state, i.e. 2 to 6 (Nokia)
  + Option 3: Evaluation is every Nth DRX cycle, where N is TBD; The measurement used for evaluating the relaxation criteria in CONNECTED mode shall fulfill the corresponding measurement requirements (delay and accuracy). (Ericsson)
  + Option 4: following RAN2 agreement (MTK)

Tentative agreement: No consensus

**Issue 2-3-4 Whether UE shall report fulfilment of relaxation when performing CGI reading?**

* Proposals
  + Option 1: The UE may evaluate the relaxation criteria, but shall not report fulfillment of the relaxation criteria if it is performing or configured to perform CGI reading measurements (Ericsson Nokia)
  + Option 2: Do not discuss the issue related to CGI reading requirement in RAN4 (Apple Huawei vivo MTK )

Tentative agreement: No consensus

**Issue 2-3-5: Granularity of RRM measurement relaxations**

* Proposals
  + Option 1: Investigation on future or Rel-18 on relaxations for specific bad beams, bad cells, bad frequencies and/or bad inter-RAT carriers (Nokia)
  + Option 2: RAN4 to only focus on UE level measurement relaxation for requirement design (Apple)
* Recommended WF
  + Suggest do not consider granularity such as specific bad beams, bad cells, bad frequencies and/or bad inter-RAT carriers within Rel-17 time frame.

Agreement: agree recommended WF

**Issue 2-3-6: RAN2 impact on RRM relaxation for RRC\_CONNECTED mode**

* Proposals
  + Option 1: Start RAN4’s work on RRC\_Connected stage (Nokia)

Agreement: no more discussion on 2nd round

### Sub-topic 2-4 Rel-17 Redcap RRM relaxation requirements

**Issue 2-4-1: Idle state relaxation requirements for the stationary criteria in intra-frequency, inter-frequency and inter-RAT**

* Proposals
  + Option 1: MTK

Agreement: Discuss directly in the corresponding CR after scaling factor is fixed. Not necessary to discuss at this section.

**Issue 2-4-2: Inactive state relaxation requirements for the stationary criteria in intra-frequency, inter-frequency and inter-RAT**

* Proposals
  + Option 1: The stationary evaluation of intra-frequency, inter-frequency and inter-RAT for NR cell in INACTIVE mode requirements shall apply the same requirements as that of the idle state, respectively (MTK)

Agreement: Option 1 has already been agreed at WF R4-2202672, no more discussion any more.

# Topic #3 Others

### Sub-topic 3-1 On Redcap UE capabilities

**Issue 3-1-1: Scope of features to be included in the reply LS**

* Proposals
  + Option 1: (CMCC)
    - RAN4 should only provide feedback to RAN2 if any RAN4 defined feature is considered as “not applicable” to RedCap UE. (Huawei Nokia)
    - Be default, all non-RedCap features should be applicable to RedCap UE unless it requires more than single carrier operation, no matter whether RAN4 defines requirements or not
  + Option 2: Our view is that Rel-15 NR requirements are the baseline. Then which Rel-16 features to support for Rel-17 RedCap is discussed and agreed on case by case manner. This means, by default all rel-16 features are not supported unless explicitly agreed. (Ericsson Apple vivo MTK ZTE)

Agreement: Directly discuss all related issues in the LS and no more discussion in the email thread at 2nd round

**Issue 3-1-2: UE capabilities in Reply LS**

* Proposals: Moderator
  + Option 1: RAN4 to respond to RAN2 LS on UE capability as follows (Ericsson Apple oppo vivo QC)

|  |  |
| --- | --- |
| **Rel-15/Rel-16 features in TS 38.133** | **RedCap RRM requirements applicability in R17** |
| Dual connectivity and carrier aggregation | Not applicable |
| 2-step RA | Applicable |
| NR measurements with autonomous gaps | Applicable |
| **Rel-17 features in TS 38.133** |  |
| SDT | Applicable |
| *Note: RAN4 will not define any RRM requirements for RedCap UE for other release 16 features which are not listed above in release 17.* | |

* + Option 2: Reply to the RAN2 LS [1] using our previous conclusions captured in the WF [R4-2115358 2] and WF [R4-2120410 3] (ZTE)
  + Option 3: Support that RAN4 to capture the high speed measurements requirements in the RedCap rel-17 specification (MTK)
  + Option 4: RAN4 should provide feedback to RAN2 if any RAN4 defined feature is considered as “not applicable” to RedCap UE (Huawei Nokia)

Agreement: Reply LS R4-2206977 is agreed

### Sub-topic 3-2 Reply LS for R2- 2201760

**Issue 3-2-1: Whether there are impacts on RAN4 specs when performing new RSRP measurement in a DL BWP associated with CD-SSB before Msg1/A retransmission based on UE implementation**

* Proposals
  + Option 1: No impact (vivo)
  + Option 2: Yes (Huawei Apple)
    - Option 2a: If a RedCap UE in idle/inactive mode is configured with a separate initial BWP associated with no SSB (CD or NCD) for RACH, UE is not required to meet Te requirements before Msg1/A retransmission.” (Huawei)
  + Option 3: Specify the condition UE is expected to perform new RSRP measurement in a DL BWP associated with CD-SSB before Msg1/MsgA retransmission when the PRACH configuration period is X [ms] or more, and/or frequency distance between CD-SSB and separate initial DL BWP for RedCap is Y [MHz] or more. FFS for X and Y. (Ericsson)
    - Example of X: 80ms for fading case; no need new RSRP measurement for stationary UEs.
    - Example of Y: 20MHz for FR1, 100MHz for FR2.
  + Option 4： Regarding RAN2 LS on RSRP measurement, RAN4 wait for potential new agreement in RAN1 to proceed. (ZTE)
  + Option 5: conclusion for issue 3-1-1 can be reused here (Nokia)
  + Option 6: up to UE implementation (MTK)

Tentative Agreement: No consensus and FFS

# Reference

[1] R4-2207070 Email discussion summary: [102-e][229] NR\_redcap\_RRM\_2, vivo, RAN4 102-e