**3GPP TSG-RAN WG2 Meeting #113e R2-2102020**

**Electronic Meeting, 25th Jan – 5th Feb 2021**

**Source: ZTE Corporation**

**Title: Summary of Offline [110][REDCAP] – RRM Relaxations**

**Agenda item:**  **8.12.3**

**Document for:** **Discussion and Decision**

# Background

This document is to kick off the following email discussion:

* [AT113-e][110][REDCAP] RRM relaxations (ZTE)

Scope: Continue the discussion on RRM relaxations based on the proposals in [R2-2100569](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2100569%20Report%20of%20Email%20discussion%5B155%5D%5BREDCAP%5D%20RRM%20relaxations.docx) marked as "continue in offline 110". Also discuss possible evaluations to be added in the Annex.

The intention of this offline is to describe options in the TR and, whenever applicable/possible, also provide some recommendations (i.e. p7 and p10 in [R2-2100569](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2100569%20Report%20of%20Email%20discussion%5B155%5D%5BREDCAP%5D%20RRM%20relaxations.docx))

Initial intended outcome: Summary of the offline discussion with e.g.:

* + - List of proposals for agreement
		- List of proposals that require online discussions
		- Corresponding TP for the TR

Initial deadline (for companies' feedback): Monday 2021-02-01 11:00 UTC

Initial deadline (for rapporteur's summary in [R2-2102020](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2102020.zip)): Monday 2021-02-01 17:00 UTC

Updated scope: Continue the discussion on p8 and the TP in p12 from [R2-2102020](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2102020.zip). Also discuss p3 from [R2-2102019](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2102019.zip) (report of offline [109])

Updated intended outcome: Summary of the offline discussion with e.g.:

* + - List of proposals for agreement
		- Corresponding TP for the TR

Deadline (for companies' feedback): Wednesday 2021-02-03 11:00 UTC

Deadline (for rapporteur's summary in R2-2102038): Wednesday 2021-02-03 13:00 UTC

# Contact information

|  |  |
| --- | --- |
| Company  | Email address |
| Apple | naveen.palle@apple.com |
| Huawei, HiSilicon | kuangyiru@huawei.com |
| vivo | Chenli5g@vivo.com |
| ZTE | liu.jing30@zte.com.cn |
| Lenovo | Shijie4@lenovo.com |
| OPPO | lihaitao@oppo.com |
| Sharp | lei.liu@cn.sharp-world.com |
| LG | aidoy.lee@lge.com |
| CATT | pierrebertrand@catt.cn |
| Ericsson | tuomas.tirronen@ericsson.com |
| MediaTek | pradeep[dot]jose[at]mediatek[dot]com |
| Futurewei | yyang1@futurewei.com |
| Qualcomm | linhaihe@qti.qualcomm.com |
| NEC | Chen\_zhe@nec.cn |
| Xiaomi | shirao@xiaomi.com |
| Intel | Yi.guo@intel.com |
| Thales | Volkerbreuer@thalesgroup.com |
| Sequans | noam.cayron@sequans.com |
| Samsung | s90.jeong@samsung.com |

# Discussion on remaining proposals

Regarding the proposals in the summary of email disc [1], after first online session, RAN2 has made following agreements.

Agreements:

1. Irrespective of RRC state, whether to enable/disable RRM relaxation function for Redcap UEs is within network’s control.
2. The following enhancements for triggering neighbour RRM relaxation in RRC\_IDLE/RRC\_INACTIVE are endorsed for inclusion in the TR. Among these solutions, -Enhancement #1, #2, #3 and #5 can be considered as higher priority. Exact TP and whether some amendments are needed/ further enhancements need to be added can be further discussed:
* Enhancement 1: Introduce additional SsearchDeltaP\_stationary threshold to support 2 level speed evaluation (i.e. stationary, low mobility);
* Enhancement 2: Take into account of beam switching in low mobility evaluation;
* Enhancement 3: UE determines its stationary property based on subscription information (e.g. USIM);
* Enhancement 4: Introduce an additional SsearchDeltaP\_correction threshold and configure the UE to use it if only it detects that it observes higher received signal power variation that do not violate stationarity i.e., rotating around itself, dynamically changing multipaths;
* Enhancement 5: Introduce additional TSearchDeltaP\_stationary to support 2-level stationarity (i.e. fixed location vs low mobility);
1. The following enhancements for neighbour RRM relaxation methods in RRC\_IDLE/RRC\_INACTIVE are endorsed for inclusion in the TR. Exact TP and whether some amendments are needed/ further enhancements need to be added can be further discussed:
* Enhancement 1: UE can stop measurements on neighbor cells for T (T>>1) hours;
* Enhancement 2: Enabling further relaxation via reducing the number of monitored RS;
* Enhancement 3: UE only perform measurements on a number of dedicated intra-freq, inter-freq cells;
* Enhancement 4: Minimize the number of measured frequencies;
1. For neighbour cell RRM relaxation in RRC\_CONNECTED, “fixed or immobile UEs” are considered with higher priority than “slightly moving UEs”.

Due to limited time, the rest proposals (marked as “continue in offline 110”) will be further discussed in this document.

|  |
| --- |
| General principle:**Proposal 1:** For measurement relaxation methods, RAN2 can discuss preferable solutions, but RAN4 should be consulted before making the final decision. Neighbour cell RRM relaxation in RRC\_CONNECTED:**Proposal 7**: Compared to RRC\_IDLE/INACTIVE, RRM relaxation in RRC\_CONNECTED can be considered with low priority if the time is limited in WI. **Proposal 8:** Capture in TR the following solutions for triggering neighbour RRM relaxation in RRC\_CONNECTED. • Solution 1: UE reports “stationary” property to network in Msg5; • Solution 2: Network provides (e.g. low mobility, not-at-cell-edge) evaluation parameters to UE via dedicated signalling; • Solution 3: AMF sends “stationary” indication to gNB (based on UE subscription); • Solution 4: UE reports “stationary” in UE Assistance Information to network;**Proposal 9:** Capture in TR the potential solutions for neighbour cell RRM relaxation methods in RRC\_CONNECTED. The exact mechanism, if any, should be decided by RAN4. From RAN2’s perspective, other solutions are not precluded (e.g. network does not configure measurements for mobility purpose, UE only performs measurement on single RS type). *Serving cell RRM relaxation in RRC\_IDLE/INACTIVE/CONNECTED***Proposal 10:** Irrespective of RRC state, serving cell RRM relaxation for Redcap UEs is not considered in Rel-17*.* |

Companies are invited to show your comments to above proposals:

**Q1.1: Do companies agree with above Proposal 1 (if no, please provide your comments)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments** |
| Apple | Yes |  |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| Sharp | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Ericsson | Yes |  |
| Nokia | Yes |  |
| MediaTek | Yes, and | We need to avoid introducing too much RAN4 impact as they are quite overloaded in Rel-17 |
| Futurewei | Yes |  |
| Qualcomm | Yes |  |
| NEC | Yes  |  |
| Xiaomi | Yes |  |
| Intel | Yes |  |
| Thales | Yes |  |
| Sequans | Yes |  |
| Samsung | Yes |  |

Summary:

There is consensus that Proposal 9 can be agreed.

**Proposal 1: For measurement relaxation methods, RAN2 can discuss preferable solutions, but RAN4 should be consulted before making the final decision.**

**Q1.2: Do companies agree with above Proposal 7 (if no, please provide your comments)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments** |
| Apple | We are ok but | Pls note that C-DRX operation is part of RRC\_CONNECTED and RedCap UEs can benefit from relaxations here. |
| Huawei, HiSilicon | Yes |  |
| vivo | No | we have strong concern on this proposal. Based on the first round of email discussion, half of companies support this proposal, but half of companies do not support this proposal. I donot know how email rapporteur gets this conclusion based on such situation. [ZTE] We are a bit surprised about this comment. If you have such strong concern on this proposal, why didn’t you provide feedback during the phase II of email discussion [155]? There was a question to collect companies’ views on the proposals. (Meanwhile, thanks to companies who participated in phase II discussion)Please note, the wording of the proposal is a bit different from original question, as explained in the summary part. We’ve added “if the time is limited in WI.” So it means, if time allows, of course both scenarios will be studied/specified. But if, unfortunately, the time is limited, then IDLE/INACTIVE scenarios can be considered with high priority. In our understanding, for recommendation to WI, it is necessary to have a high level plan rather than put everything at the same level. [vivo] Thanks for the explanation. So how to determine whether the time is limited in WI or not? Our understanding is that, this discussion will happen in RANP during WID drafting and TU allocation. It is not fair for one feature to determine whether it is high/low priority independently. We should consider together with other features. As email rapporteur, I assume we should truly reflect the discussion situation. Our understanding is that, in the SI phase, we should focus on the technique issue, list all possible solutions with pros and cons. But which part is high priority/which part is lower priority should be considered together with other features. This discussion could happen in RAN plenary when drafting WID. So we suggest not to waste time to discuss this kind of proposal. |
| ZTE | Yes |  |
| Lenovo | Yes |  |
| OPPO | No | Among the three use cases for RedCap, IWSN is likely to stay in RRC IDLE or RRC INACTIVE for most of the time, but for video surveillance and wearables, the situation may be different. For video surveillance and wearables in RRC CONNECTED with low mobility, RRM relaxation would also play an important role for UE’s power saving. |
| Sharp |  | We think RRM relaxation in RRC\_CONNECTED has benefits for power saving of RedCap UEs. Seems it may be quite difficult to get consensus on the priority at this stage, then it might be possible to be left to RANP or WI phase. |
| LG | Yes |  |
| CATT | Yes |  |
| Ericsson | Yes | If something is agreed to be done for RRC\_CONNECTED, the gains achieved over the mechanisms specified in Rel-16 Power saving should be clearly demonstrated.Note also possible enhancements in Rel-17 PowSav.  |
| Nokia | No | RRM relaxations for IDLE/INACTIVE were introduced in Rel-16 and RedCap UE should be able to implement these. However CONNECTED mode relaxations were not introduced in Rel-16 and therefore these should be considered in Rel-17 for new use cases. In addition, we think that RAN should do prioritization, if any, instead of RAN2. |
| MediaTek | OK to go with the majority | For ‘truly stationary’ UEs, there is an opportunity to reduce connected mode power consumption when the UE is in connected DRX. |
| Futurewei | Yes |  |
| Qualcomm | See comment | We can agree in principle but do not think we need to make a conclusion in this meeting.  |
| NEC | Yes  |  |
| Xiaomi | Yes |  |
| Intel | No | It should be discussed in RANP when we know the detailed scope of the WI and corresponding TU. And then check carefully what should be low priority or be ruled out if the scope cannot fit in the given TUs. |
| Thales | Yes | RRM relaxation for Idle/Inactive should have priority. In addition also state transitions from Connected to Idle or Inactive should be studied Once they are agreed further relaxations in Connected should be discussed. Note: C-DRX is already part of NR and can be used as baseline. |
| Sequans | Yes |  |
| Samsung | Yes |  |

Summary:

13 companies agree with this Proposal, 4 companies disagree, 3 companies think such decision can be made during RANP. Since there is slight majority (13/20) supporting this proposal, rapporteur would like to clarify this proposal is not trying to preclude RRM relaxation in RRC\_CONNECTED scenario. So rapporteur would suggest to discuss it online:

**Proposal 7: To online discuss the following options:**

* **Alt 1: Add a recommendation in the conclusion of the TR that, compared to RRC\_IDLE/INACTIVE, neighbour cell RRM relaxation in RRC\_CONNECTED can be considered with lower priority.**
* **Alt 2: Not to add any recommendation for neighbour cell RRM relaxation in the conclusion of the TR (The prioritization between RRM relaxation in RRC\_IDLE/INACTIVE and RRM relaxation in RRC\_CONNECTED, if any, will be decided by RANP).**

**Q1.3: Do companies agree with above Proposal 8 (if no, please provide your comments)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments** |
| Apple | Agree, and | We would like to bring up another potential property of atleast certain RedCap UEs in that instead of (or in addition to) the stationary property, there could be UEs whose mobility is localized, and reporting of this characteristic can also follow the same principles proposed in proposal 8. We understand more discussion on this is in questions 3.1/3.2 below. |
| Huawei, HiSilicon | Agree, but | In our understanding, it is up to network to decide whether to enable UE RRM measurement relaxation in RRC\_CONNECTED, the solutions in proposal 8, e.g. UE/AMF provide information to the gNB for triggering RRM measurement relaxation, and the gNB makes the decision. |
| Vivo | Agree, but | We are open with the solutions. I assuming detailed triggering criteria could be discussed in WI phase. The solutions listed here are just for assistance. In this way, we suggest to have a minor change: Capture in TR the following solutions for assistanting triggering neighbour RRM relaxation in RRC\_CONNECTED. |
| ZTE | Agree |  |
| Lenovo | Agree |  |
| OPPO | Agree |  |
| Sharp | Agree |  |
| LG | Agree, and comments | We would like to clarify what “property” in Solution 1 means. Our understanding of the solution is that the UE may indicate its stationary characteristics from birth or temporarily stationary status, but the word “property” seems to close to the former one. So we propose to change the wording slightly, e.g. “UE reports “stationary” status to network in Msg5”. |
| CATT | Agree |  |
| Ericsson | Agree, but | OK to include options in TR. We have similar view as vivo on detailed discussions later, and with Huawei that mechanisms should be under NW control. See also Q2.3. |
| Nokia | Agree | In addition. we agree that any mechanism should be strictly under NW control. |
| MediaTek | Agree | We are OK to list all the solutions in the TR with no recommendation. The solution should be decided in the WI phase. We should aim to align solutions with the connected mode RLM discussions in Rel-17 power savings, to minimize specification and implementation effort. |
| Futurewei | Agree |  |
| Qualcomm | Agree |  |
| NEC | Agree  |  |
| Xiaomi | Yes |  |
| Intel | Agree |  |
| Thales | Agree |  |
| Sequans | Yes |  |
| Samsung | Agree, and | Regarding vivo's comment, we assume all the solutions described in TR are some part of potential candidates for assistance. And details will be determined in WI. So, we are fine with vivo's change. |

Summary:

There is consensus to capture all potential solutions in the TR. Based on company comments, Proposal 8 is slightly updated as below: (The draft TP is updated accordingly)

**Proposal 8: Capture in TR the following solutions ~~for~~to assist triggering neighbour RRM relaxation in RRC\_CONNECTED.**

**• Solution 1: UE reports “stationary” ~~property~~status to network in Msg5;**

**• Solution 2: Network provides (e.g. low mobility, not-at-cell-edge) evaluation parameters to UE via dedicated signalling;**

**• Solution 3: AMF sends “stationary” indication to gNB (based on UE subscription);**

**• Solution 4: UE reports “stationary” in UE Assistance Information to network;**

**Q1.4: Do companies agree with above Proposal 9 (if no, please provide your comments)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments** |
| Agree |  |  |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| Sharp | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Ericsson | Yes |  |
| Nokia | Yes |  |
| MediaTek | Yes |  |
| Futurewei | Yes |  |
| Qualcomm | Yes |  |
| NEC | Yes  |  |
| Xiaomi | Yes |  |
| Intel | Agree |  |
| Thales | Yes |  |
| Sequans | Yes |  |
| Samsung | Yes |  |

Summary:

There is consensus that Proposal 9 can be agreed.

**Proposal 9: Capture in TR the potential solutions for neighbour cell RRM relaxation methods in RRC\_CONNECTED. The exact mechanism, if any, should be decided by RAN4. From RAN2’s perspective, other solutions are not precluded (e.g. network does not configure measurements for mobility purpose, UE only performs measurement on single RS type).**

**Q1.5: Do companies agree with above Proposal 10 (if no, please provide your comments)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments** |
| Agree |  |  |
| Huawei, HiSilicon | Yes |  |
| vivo | No | Honestly, during the first round of email discussion, we did not see any technique reason for not supporting RRM relaxation in IDLE/INACTIVE mode. Companies’ reasons are mainly about the performance degrading in connected mode, e.g. HO failure or RLF.In our understanding, we should focus on the technique discussion on the feasibility and benefit in the SI phase. Whether to include this feature could be handled during the discussion on recommendation or WID drafting. Regarding the feasibility on RRM relaxation for serving cell for RedCap at least in idle/inactive mode, we think there is no technique issue. [ZTE] As email disc rapporteur, we believe every companies had their technical reason when providing their inputs to the email discussion.On behalf of ZTE, please see our detailed technical justification below:[vivo] During the first round of discussion, we only found that ZTE agreed with MTK, (BTW, one of points is: eDRX automatically introduces serving cell relaxation, which we also agreed and it is what I argued online and here), but unfortunately, did not see any technical justification. As I commented during online discussion, in legacy eDRX in LTE, there is no RRM requirement outside the PTW. It means that, RRM on serving cell is required to be performed only in PTW based on the requirement defined in RAN4. In this way, there is RRM relaxation on serving cell in eDRX case (more specifically, no RRM outside PTW, which is similar as Rel-16 RRM relaxation when both criteria are fulfilled for a period). If eDRX could be supported for NR, RRM relaxation for serving cell could be naturally supported. Thus, at least we should confirm the feasibility on RRM relaxation for serving cell in idle/inactive mode. If some companies really hate this feature, they could provide preference when discussing the recommendation or WID. But we donot accept such proposal without any technique reason.  |
| ZTE | Agree | Response to Vivo about our technical reasons:1. First, so far, we haven’t seen any feasible solution of serving cell RRM relaxation without impacting IDLE/INACTIVE eighbor (e.g. paging monitoring). Right now, idle/inactive UE has to wake up at least every paging cycle, in order to detect the best SSB for paging reception. In addition to this, the UE can sleep for lower power consumption. By introducing eDRX, the paging cycle will be extended, thus power consumption caused by serving cell measurement can be reduced naturally. The simulation result (from R2-2100459) shows there is power saving gain, but it is based on the assumption that UE will perform serving cell measurement every four paging cycle, this definitely impacts the IDLE/INACTIVE eighbor;

[vivo] Companies providing technique comments should be based on evidence. In the context of our discussion, we assume RRM relaxation on serving cell for “stationary” UEs in idle/inactive mode. We would like to check how “definitely” impacts to idle/inactive. Thanks.1. The simulation results from Vivo shows that mobility impact will be “HO failure rate changes from 0%~0.26%”. First, we believe the simulation does not consider the case that eighbor cell measurements are also relaxed based on the evaluation of serving cell quality. (We believe in real deployment, UE will first relax eighbor cell measurement, and then serving cell. The condition for triggering serving cell relaxation should be stricter than eighbor cell). Then once serving cell degrades rapidly, then eighbor cell measurement may still in relaxing mode, therefore the real mobility performance impact might be much higher than what is shown in the simulation results. In addition, 0.5% decrease of HO failure rate is a huge problem in real deployment, so even 0.26% HO failure rate decrease is non negligible performance impact.

[vivo] That is true, we did not consider the neighboring cell relaxation during evaluation. We agree ZTE’s observation for connected mode, and OK with the suggestion on the TP part.1. Regarding Vivo’s comment on eDRX, as we explained during online, we shouldn’t mix up “RRM requirement” with “RRM relaxation”. For eDRX, RAN4 will define corresponding RRM requirements for eDRX case. But “RRM relaxation” means whether to do further relaxation on top of those RRM requirements. There are totally different things.

[vivo] Based on the comments, I suppose we have some gap on the meaning or “RRM relaxation”. I do not mind to explain what “RRM relaxation” means. In Rel-16, RAN4 defined RRM measurement requirement by two approaches to achieve RRM relaxation:1. Using scaling factor, e.g. RAN4 define requirement for 3 or 4 times of measurement interval.
2. Stopping measurement for a period, e.g. 10min or 1hour. That is there is no requirement for a period of stopping measurement.

In general, we agree with you, that RRM relaxation means whether to do further relaxation on top of existing requirements. Thus, any relaxation on top of existing requirements is “RRM relaxation”. In NR, we currently do not have RRM requirement for eDRX. If we defined corresponding RRM requirement for eDRX e.g. like what we have in LTE, there is no RRM requirement outside PTW. It is RRM relaxation for serving cell (comparing with existing RRM requirement in NR), which is exact 2nd approach of RRM relaxation: stopping measurement for a period, the length is (eDRXcycle - PTW). There is only RRM requirement inside PTW.I donot know why you mentioned they are totally different things. |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| Sharp |  | Yes for RRC\_CONNECTED. For RRC\_IDLE, we have sympathy on the comments about the serving cell measurement for LTE eDRX. Maybe we can first check whether LTE serving cell measurement rule can be reused for NR if eDRX is configured, and of course RAN4 should be consulted. |
| LG | Yes |  |
| CATT | Yes |  |
| Ericsson | Agree | Agree with ZTE comments: The technical issues were brought up in previous email/offline discussions already. In case there would be demonstrable and significant gains without unwanted side-effects, such improvements could be considered but until now this kind of analysis has not been presented. We also agree with ZTE explanation w.r.t. RRM requirements during eDRX vs. additional RRM relaxation (i.e. we are talking about the latter here – eDRX requirements are then another matter to be discussed in RAN4). |
| Nokia | Agree |  |
| MediaTek | Yes | Serving cell measurement relaxations are largely pointless as the UE anyways needs to monitor PDCCH on the serving cell every DRX/eDRX cycle. If we follow LTE baseline, RRM requirements for the serving cell are a function of the eDRX cycle. Our understanding is that these are baseline RRM requirements, whereas we understand from vivo’s comments that they view this as RRM relaxation. Regardless, we both agree that serving cell RRM requirements will be a function of eDRX cycle similar to LTE. |
| Futurewei | Yes |  |
| Qualcomm | Yes |  |
| NEC | Yes  |  |
| Xiaomi | Yes | In addition to the degradation of performance, we are concerned about due to serving cell measurement relaxation, the triggering condition may not be indicated accurately. |
| Thales | Yes |  |
| Sequans | Yes | Agree with MediaTek and others |
| Samsung | Agree |  |

Summary:

Almost all companies agree with Proposal 10, while one company shows strong objection to this proposal. In addition, one company agrees that serving cell RRM relaxation is not needed for RRC\_CONNECTED, and thinks LTE serving cell measurement rule can be reused for NR if eDRX is configured. As clarified by several companies RAN4 defined RRM requirement for eDRX is independent from the discussion of RRM relaxation. Since there is a strong objection, rapporteur would suggest to discuss this proposal online.

**Proposal 10: Add a recommendation in the conclusion of the TR that irrespective of RRC state, serving cell RRM relaxation for Redcap UEs is not considered in Rel-17 (This does not impact RAN4 to define RRM requirement for eDRX case)*.***

# Discussion on draft TP

Based on agreements and the rest proposals of summary of email disc, rapporteur provides a draft TP in FTP folder for further discussion, it is drafted based on the latest endorsed TP [2]. In this section, companies are welcome to check the draft TP, and provide possible evaluations if any.

For easy discussion, we split the draft TP into 3 parts:

* **Part 1: Triggering condition for RRM relaxation in RRC\_IDLE and RRC\_INACTIVE**

|  |
| --- |
| 8.4.1.1 RRM relaxation in RRC\_IDLE and RRC\_INACTIVERel-16 NR RRM relaxation procedures are taken as a baseline to study further enhancements of neighbour cell RRM relaxation for Redcap UEs in RRC\_IDLE and RRC\_INACTIVE. For triggering neighbour cell RRM relaxation for RedCap UEs in RRC\_IDLE and RRC\_INACTIVE, based on Rel-16 triggering criterion, following enhancements can be considered:* **Enhancement 1:** Introduce additional SsearchDeltaP\_stationary threshold to support 2-level speed evaluation (i.e. stationary and low mobility), for example:
	+ Stationary: (SrxlevRef – Srxlev) < SSearchDeltaP\_stationary
	+ Low mobility: SSearchDeltaP\_stationary <= (SrxlevRef – Srxlev) < SSearchDeltaP\_low\_mobility

Pros:* From specification point of view, it is simple and straightforward enhancement based on Rel-16 mechanism;
* It supports 2 levels speed evaluation (i.e. stationary and low mobility), so it provides flexibility of designing different RRM relaxation levels for different mobility scenarios.

Cons:* Unclear whether UE’s mobility level can be accurately determined;
* Channel or link (RSRP/RSRQ) may change even if UE is purely stationary, thus it may not be a reliable way to distinguish between truly stationary and low mobility UE.
* **Enhancement 2:** Introduce additional TSearchDeltaP\_stationary to support 2-level speed evaluation (i.e. fixed location and low mobility).

Pros:* From specification point of view, it is simple and straightforward enhancement based on Rel-16 mechanism;
* It supports 2 levels speed evaluation (i.e. stationary and low mobility), so it provides flexibility of designing different RRM relaxation levels for different mobility scenarios.

Cons:* Unclear whether UE’s mobility level can be accurately determined.

Note: There can be synergies if Enhancement 1 is combined with Enhancement 2.* **Enhancement 3:** Take into account of beam switching in low mobility evaluation, for example:
	+ Stationary:
		- number of beam switch < N1 or
		- no beam switch and (SrxlevRef – Srxlev) < SSearchDeltaP\_stationary
	+ Low mobility:
		- number of beam switch < N2 or
		- SSearchDeltaP\_stationary <= (SrxlevRef – Srxlev) < SSearchDeltaP\_low\_mobility

Pros:* Using beam level measurement results can assess UE’s movement more accurately than cell measurement, because UE may move among beams but without changing the cell level results;
* Potentially good for detecting “circular motion” around base station.

Cons:* Unclear whether UE’s mobility level can be accurately determined;
* Beam level measurement results may fluctuate more than cell-level results, so it might cause misjudgement;
* **Enhancement 4:** UE determines its stationary property based on subscription information (e.g. USIM).

Pros:* It is simpler and faster than evaluating the quality of serving cell.

Cons:* Only applicable to limited scenarios, e.g. fixed-location devices;
* Channel or link (RSRP/RSRQ) may change (e.g. may be low) even if UE is fixed-location, RRM relaxation only depends on fixed-location information may impact the performance.
* **Enhancement 5:** Introduce an additional SsearchDeltaP\_correction threshold and configure the UE to use it if only it detects that it observes higher received signal power variation that do not violate stationarity, i.e. rotating around itself, dynamically changing multipath.

Pros:* Can be used to differentiate different stationary cases. E.g. stationary or stationary with rotating around itself.

Cons:* Covers specific use case where device is rotating around itself.
 |

Above context related to agreement 2, and also including the Pros/Cons analysis summarized in R2-2100569 (the bullets marked as FFS are not listed). Companies are asked to provide feedback on the above suggestion for baseline text and provide further evaluations, if needed.

**Q2.1: Do companies agree with above text proposal added to section 8.4.1?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments or TP suggestions** |
| Apple | Agree |  |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| Lenovo | Yes |  |
| OPPO |  | For enhancement 3, we doubt how to evaluate the number of beam switch since there is no serving beam concept for UEs in RRC IDLE.[Rapp] We understand the UE is aware of the detected beam information of serving cell, because UE has to derive cell level RSRP/RSRQ based on the measured beam results. So enhancement 3 requires the UE to further evaluate the changes of beam level results of serving cell. |
| Sharp | Yes |  |
| LG | Agree |  |
| CATT | Yes |  |
| Ericsson | Yes | TP looks OK in general. If the proposal is agreed we think editorial corrections and additional clarifications should be made when implementing the text to TR, if needed.[Rapp] Ok, thanks. |
| Nokia | Yes, but | See proposed modification above for 5[Rapp] Ok, the draft TP is updated accordingly. |
| MediaTek | See comment | For enhancement #4, Con #2 (“Channel or link (RSRP/RSRQ) may change (e.g. may be low) even if UE is fixed-location…”) can be removed. Since the UE is configured to be stationary, it will not have to change the serving cell, therefore changes in the serving link RSRP/RSRQ (e.g. if the device is rotating on a fixed position) can be ignored, the serving cell will never change.[Rapp] This was added based on the comments from Huawei? Although the device is stationary (fixed-located), the RSRP/RSRQ of serving cell may still change, e.g. a car passes the device. Thus cell reselection may be needed. But rapporteur thinks this only happens to cell edge UEs (locating at the overlapping area of two intra-freq cells). So rapporteur would suggest to revise the sentence as:* Channel or link (RSRP/RSRQ) may change (e.g. may be low) even if UE is fixed-location, RRM relaxation only depends on fixed-location information may impact the performance if the UE is located at cell edge.
 |
| Futurewei | Yes |  |
| Qualcomm | Yes | We’d like to suggest adding a note as follows:For triggering neighbour cell RRM relaxation for RedCap UEs in RRC\_IDLE and RRC\_INACTIVE, based on Rel-16 triggering criterion, following enhancements can be considered (other solutions are not precluded):This note also applies to Q2.2 and Q2.3.[Rapp] Makes sense, although we haven’t identified other solutions so far, but rapporteur understands other solutions are not precluded. The draft TP is updated accordingly.  |
| NEC | Yes  |  |
| Xiaomi | Yes | We suggest to have a minor change for the description of enhancement 3: Take into account of beam switching in speed evaluation, for example……[Rapp] Ok. |
| Intel | Yes |  |
| Sequans | Yes |  |
| Samsung | Yes, but minor change is requested | I have concern about one of the Cons of enhancement 1: "*Channel or link (RSRP/RSRQ) may change even if UE is purely stationary, thus it may not be a reliable way to distinguish between truly stationary and low mobility UE."*. Note that the triggering of RRM relaxation should be based on not UE's mobility but channel quality. In order words, even if UE is purely stationary, if channel changes (due to surroundings change) UE should not perform RRM relaxation. This can be achieved with measurement-based approach (including enhancement 1). Therefore, we would like to remove the underlined sentence from the Cons of enhancement 1. P.S. Apology to rapporteur for not mentioning this issue in last email discussion [155][Rapp] We tend to agree with the comment, the original intention is that due to RSRP/RSRQ changes, UE may consider it is in low-mobility, even if the UE is fix-located. But seems the concern of the reliability can already be captured by the first bullet of Cons:* Unclear whether UE’s mobility level can be accurately determined;

So we are ok to remove this bullet from Enhancement 1.[Rapp-2] Update based on the comments in email.To combine bullet 1 and bullet 2, so people can get the full picture why UE’s mobility level may not be accurately determined. * Unclear whether UE’s mobility level can be accurately determined, because channel or link (RSRP/RSRQ) may change even if UE is purely stationary, thus it may not be a reliable way to distinguish between truly stationary and low mobility UE.

Additionally, we would like to clarify that RAN2 is open to any other solution as well: "*For triggering neighbour cell RRM relaxation for RedCap UEs in RRC\_CONNECTED, following solutions can be considered (RAN2 is also open to any other solution in addition to the followings)".* And this clarification can apply to Part 2 and Part 3.[Rapp] We understand the comment is same as Qualcomm’s comment, will add “other solutions are not precluded” to Part 1/2/3. |

Summary:

Almost all companies agree with draft TP, some companies also provide further wording proposals to the TP. Please find rapporteur’s response above, and the TP is updated accordingly.

* **Part 2: RRM relaxation methods in RRC\_IDLE and RRC\_INACTIVE**

The draft TP is shown below:

|  |
| --- |
| For neighbour cell RRM relaxation methods for RedCap UEs in RRC\_IDLE and RRC\_INACTIVE, based on Rel-16 NR RRM relaxation methods, following enhancements can be considered:* **Enhancement 1:** UE can stop measurements on neighbour cells for T (T>>1) hours.

Pros:* It is useful to further reduce power consumption for truly stationary UEs.

Cons:* Not applicable to wearable devices;
* Based on evaluation scenario in TR, the gain compared to 1 hour measurement interval is not significant.
* **Enhancement 2:** Enabling further relaxation by reducing the number of monitored RS.

Pros:* Since UE only needs to measure specific beams, the power consumption can be reduced and the time period of measurement can be reduced.

Cons:* **Enhancement 3:** UE only perform measurements on a number of dedicated intra-frequency, inter-frequency cells.

Pros:* For stationary UEs, can avoid UE to measure all frequencies/cells broadcast.

Cons:* **Enhancement 4:** Minimize the number of measured frequencies.

Pros:* For stationary UEs, can avoid UE to measure all frequencies/cells broadcast.

Cons: |

Above context related to agreement 3, and also including the Pros/Cons analysis summarized in R2-2100569. Companies are asked to provide feedback on the above suggestion for baseline text and provide further evaluations, if needed.

**Q2.2: Do companies agree with above text proposal added to section 8.4.1.1?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments or TP suggestions** |
| Apple | agree |  |
| Huawei, HiSilicon | Yes, but | In our contribution R2-2101257, we propose another solution for neighboring cell RRM measurement relaxation in RRC\_IDLE/INACTIVE. In the case that measurement interval expanded with scaling factor of 3 times based on Rel-16 NR RRM relaxation method, the truly stationary UEs can further expand the measurement interval to 1 hour to reduce power. We also provided simulation results. Thus, we propose to add the following in the TP:* **Enhancement 5:** Expand the scenario of performing “stop measurement for 1 hour” for stationary UEs.

Pros:* It is useful to further reduce power consumption for truly stationary UEs.

Cons:[Rapp] Ok, Enhancement 5 is added to TP. In our understanding, Enhancement #5 means even if the cell does not configure “low-mobility” evaluation parameters, Redcap UEs can stop measurement for 1 hour as long as “stationary” condition is fulfilled.  |
| vivo | Yes |  |
| ZTE | Yes | We are ok with HW’s proposal. |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| Sharp | Yes |  |
| LG | Yes, but see comments | We are fine with listed enhancements, and want to clarify enhancement 3 – What does “dedicated” frequency mean here? Does it mean particular frequencies are provided via dedicated signaling or particular frequencies may be pointed by the network among broadcast neighbor frequencies?[Rapp] Based on company contributions, “dedicated” intra-freq, inter-freq cells mean the UE can based on its serving cell measurement results, together with cell deployment information (may be provided by network), to know which neighbour cells are nearby, which are not. Then to avoid measuring the cells which are located far away. Additionally, in our contribution R2-2100581, we propose to add enhancement for the measurement relaxation method of frequency reduction. As UE should fulfil the low mobility criterion for a time period of TSearchDeltaP to check that the UE has entirely, but we believe that once RedCap stationary fulfils the low mobility criterion, it is low possibility that UE’s mobility increases rapidly. Therefore, we propose to trigger the measurement relaxation quickly before TSearchDeltaP expiry so that the UE can maximize the power saving.* **Enhancement 6:** Upon UE fulfils the criterion, UE can trigger the measurement relaxation on part of configured frequencies before TSearchDeltaP expiry.
* UE can maximize its power saving on the measurements.

Cons:[Rapp] We would like to clarify a bit more. In our understanding, TsearchDeltaP is part of “low-mobility” evaluation. So in above Enhancement 6, for “Upon UE fulfills the criterion”, whether this criterion includes the evaluation of TsearchDeltaP? Or it is referring to other stationary evaluation solution (e.g. enhancement 4 in Q2.1)? In our understanding, the Redcap UE that fulfills Enhancement #4 is not required to re-evaluate “low-mobility” criteria, so it can ignore SsearchDeltaP parameter if configured. [Rapp-2] Update based on the comments in email, the solution has been clarified, so capture the following to the TP. * **Enhancement 6:** Upon UE fulfils the criterion (i.e. RSRP threshold evaluation), UE can trigger measurement relaxation on part of configured frequencies even if the criterion has not been fulfilled for a period of TSearchDeltaP.

Pros:* UE can maximize its power saving on the measurements because measurement relaxation can be started earlier.

Cons:* Without evaluating the duration of criterion has been fulfilled, it may cause misjudgement due to weak robustness.
 |
| CATT | Yes |   |
| Ericsson | Yes, with additions | Enhancement 2, cons: Unclear if useful for FR1, potentially more benefit for FR2 UEs, exact gain is not clear (e.g. due to avering[Rapp] In our understanding, enhancement #2 also applies to FR1 UEs. As long as the number of measured beam is reduced, the UE can save its power from not measuring corresponding OFDM symbols. Please let me know if there is further comment. Enhancement 3 cons: Not clear if RedCap will support all legacy measurements, e.g. inter-cells? Such details need to be sorted out first. Relaxation may require additional efforts for network planning.[Rapp] We think legacy intra-freq and inter-freq measurement will be basic features that supported by Redcap UEs. But we agree Enhancement 3 may require additional effort for network planning. So add following to cons:* May require additional effort for network planning;

Enhancement 4 cons: If the UE actually does moves or radio conditions change enough, impact on cell-reselections. Also for enhancement 4, what does minimize exactly refer to here? Who controls this, even for stationary device some measurements would be needed? [Rapp] Ok to add the Cons, and seems it also applies to Enhancement 3, so add it to both. For “minimize”, based on company contribution, the intention is to only measure partial broadcast frequencies (e.g. serving frequency and 1 or 2 frequencies). In our understanding the selected frequency should be controlled by network.  |
| Nokia | Yes |  |
| MediaTek | Yes |  |
| Futurewei | Yes |  |
| Qualcomm | Yes |  |
| NEC | Yes  |  |
| Xiaomi | Yes | About enhancement 1 Cons：- Not applicable to wearable devices;We wonder why this is not applicable to wearable devices. Once a moving UE whose the serving cell measurement is not fulfilled with the condition, UE will exit the relaxed measurement. Please correct me if I am wrong, thanks.[Rapp] Ok, I see, the comment makes sense to us. I will remove this bullet. Companies are encouraged to double check if you have different views.  |
| Intel  | Yes |  |
| Thales | Yes |  |
| Sequans | Yes |  |
| Samsung | Yes | See the 2nd comment for Q2.1 |

Summary:

Almost all companies agree with draft TP, some companies also provide further wording proposals to the TP. Please find rapporteur’s response above, and the TP is updated accordingly.

* Part 3: RRM relaxation in RRC\_CONNECTED

The draft TP is shown below:

|  |
| --- |
| 8.4.1.2 RRM relaxation in RRC\_CONNECTEDFor neighbour cell RRM relaxation in RRC\_CONNECTED, “fixed or immobile UEs” are considered with higher priority than “slightly moving Ues”. For triggering neighbour cell RRM relaxation for RedCap Ues in RRC\_CONNECTED, following solutions can be considered:* **Solution 1:** UE reports “stationary” property to network in Msg5.

Pros:* Allows UE to report to network if it is temporarily stationary, so network can change its RRM configuration timely.

Cons:* Channel or link (RSRP/RSRQ) may change even if UE is purely stationary, so it may impact handover performance if UE cannot cancel RRM relaxing timely.
* **Solution 2:** Network provides (e.g. low mobility, not-at-cell-edge) evaluation parameters to UE via dedicated signalling.

Pros:* Reusing Rel-16 mechanism in Connected Ues, maximize the commonality with idle/inactive Ues;
* Network can set evaluation parameters to UE, so it is more reliable and impacts on performance can be reduced.

Cons:* Network needs to configure UE with additional parameters for RRC\_CONNECTED;
* Takes away the control from network in RRC\_CONNECTED to some extent.
* **Solution 3:** AMF sends “stationary” indication to gNB (based on UE subscription).

Pros:* The information is derived from UE subscription information, such fixed-location UE will not move, so performance impact can be minimized.
* It is useful in potentially reducing the amount of measurements, and can enable network to configure more power-efficient RRM in RRC\_CONNECTED.

Cons:* Only applicable to limited scenarios, e.g. fixed-location devices.
* Channel or link (RSRP/RSRQ) may change even if UE is purely stationary, so it may impact handover performance if UE cannot cancel RRM relaxing timely.
* **Solution 4:** UE reports “stationary” in UE Assistance Information to network.

Pros:* Allows UE to report to network if it is temporarily stationary, so network can change its RRM configuration timely.

Cons:* Channel or link (RSRP/RSRQ) may change even if UE is purely stationary, so it may impact handover performance if UE cannot cancel RRM relaxing timely.
* **Solution 5:** Network enables measurement relaxation based on UE’s measurement report.

Pros:* It keeps the control fully on network side.

Cons:* It relies on UE measurement reporting.

For neighbour cell RRM relaxation methods for RedCap Ues in RRC\_CONNECTED, the exact mechanism, if any, will be decided by RAN4. But from RAN2’s perspective, other solution are not precluded (e.g. network does not configure measurements for mobility purpose, UE only performs measurement on single RS type). |

Above context related to Proposal 8 and Proposal 9, and also including the Pros/Cons analysis summarized in R2-2100569. Companies are asked to provide feedback on the above suggestion for baseline text and provide further evaluations, if needed.

**Q2.3: Do companies agree with above text proposal added to section 8.4.1.2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments or TP suggestions** |
| Apple | yes |  |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| Sharp | Yes |  |
| LG | Yes | As we commented in Q1.3, for solution one, we suggest to change the solution as “UE reports “stationary” status to network in Msg5”.[Rapp] Ok.Additionally, we suggest to update the Pros, because we think it is more important to indicate UE’s operation rather than just stationary state :Pros:Allows UE to report to network if it is temporarily stationary so that it is relaxing the measurements, so network can change its RRM configuration timely.[Rapp] If we understand the comment correctly, the suggestion is to inform network whether the UE is currently relaxing the measurements or not? But this part is used to capture the potential solutions for triggering RRM relaxation. Seems reporting the status of RRM relaxation is not related to the triggering condition itself.Some company also proposed to let network be aware of the measurement relaxing status of RRC\_CONNECTED UEs. In our understanding, the information may be useful to network, and should be applicable to all solutions (except solution 5). But such details can be discussed during WI phase when discussing the complete solution of RRM relaxation in RRC\_CONNECTED.  |
| CATT | Yes |   |
| Ericsson | Yes, with additions/clarifications | Solution 1: Based on the description (“Allows UE to report to network if it is temporarily stationary”), this seems to imply the reporting would be based on the measurements/evaluation done during idle/inactive states. This should be clarified[Rapp] We understand current solution 1 does not describe how UE derives this information. It can be based on the evaluation during idle/inactive state, or based on UE’s location info (e.g. GPS), or based on subscription information. Not sure whether it will be specified in the end or leave it to UE implementation, but we think the details can be discussed during WI phase. Any suggestion to the wording itself?Solution 2: Perhaps this could be combined with e.g. solution 1 – could be clarified in TP that the methods need not be mutually exclusive.[Rapp] The comment is related to the above comment to Solution 1? As explained above, Solution 1 could work even without solution 2 (UE can even follow its strategy to evaluate the fluctuation of serving cell). Solution 4: Same as for Opt 1, how does UE determine it is stationary? Our understanding is that the UE could send such information multiple times when it is in RRC\_CONNECTED, thus the UE needs to determine somehow it is stationary. [Rapp] Same comment as to Solution 1.Solution 5: It would be good to add a phrase (in “pro”) stating that UE measurement report would be based on the existing mechanism (at least this was the original intention).[Rapp] Ok.Regarding all “stationary” conditions directly announced by UE or read from subscription information: As commented earlier we do not this information can be 100% accurate as physical movement cannot be prevented in practice. Thus we would like to capture this as a “con” e.g. in Opt 1, 3, 4. [Rapp] We would like to clarify, whether it is already covered by following bullet?* Channel or link (RSRP/RSRQ) may change even if UE is purely stationary, so it may impact handover performance if UE cannot cancel RRM relaxing timely.
 |
| Nokia | Yes |  |
| MediaTek | See comment | For solution #4, Con “Channel or link (RSRP/RSRQ) may change even if UE is purely stationary…” can be removed. Given that the UE is stationary at deployment, and the gNB is not moving, there is no case of a handover.[Rapp] Same response as to Q2.1. This was added based on the comments from Huawei. Although the device is stationary (fixed-located), the RSRP/RSRQ of serving cell may still change, e.g. a car passes the device. Thus cell reselection may be needed. But rapporteur thinks it only happens to cell edge UEs (locating at the overlapping area of two intra-freq cells). So suggest to revise the sentence as: Channel or link (RSRP/RSRQ) may change even if UE is purely stationary, so it may impact handover performance if UE is located at cell edge and cannot cancel RRM relaxing timely. |
| Futurewei | Yes |  |
| Qualcomm | Yes |  |
| NEC | Yes  |  |
| Xiaomi | Yes |  |
| Intel | Yes |  |
| Thales | Yes |  |
| Sequans | Yes |  |
| Samsung | Yes | See the 2nd comment for Q2.1. |

Summary:

Almost all companies agree with draft TP, some companies also provide further wording proposals to the TP. Please find rapporteur’s response above, and the TP is updated accordingly.

**Q2.4: Do companies have any other comments to the draft TP (uploaded in FTP folder)?**

|  |  |
| --- | --- |
| **Company** | **Comments or TP suggestions** |
| Huawei, HiSilicon | We provided the TP in our contribution R2-2101257, and suggest it can be discussed in the following clause.[ZTE] Thanks for that, and sorry for my carelessness of missing it.  |
| Vivo | We could provide the recommendation on the RRM relaxation part after we conclude the above open issues. |
|  |  |

# Discussion on draft TP from contributions

During this meeting, there are two company contributions containing draft TP:

[R2-2100459](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2100459_TP%20for%20TR%2038875%20on%20evaluation%20for%20RRM%20relaxation.docx) TP for TR 38875 on evaluation for RRM relaxation vivo, Guangdong Genius discussion Rel-17 FS\_NR\_redcap

[R2-2101461](file:///C%3A%5CData%5C3GPP%5CRAN2%5CDocs%5CR2-2101461.zip) Localized mobility of some RedCap devices Apple Inc discussion Rel-17 FS\_NR\_redcap

[R2-2101257](file:///D%3A%5C%5CDocuments%5C%5C3GPP%5C%5Ctsg_ran%5C%5CWG2%5C%5CTSGR2_113-e%5C%5CDocs%5C%5CR2-2101257.zip%22%20%5Co%20%22D%3ADocuments3GPPtsg_ranWG2TSGR2_113-eDocsR2-2101257.zip) RRM measurement relaxation for RedCap UE Huawei, HiSilicon discussion Rel-17

For R2-2100459, it is requested to add simulation results to the TR, including the simulation results for serving cell RRM relaxation in RRC\_IDLE/INACTIVE, and the simulation results for RRM relaxation in RRC\_CONNECTED. Companies are welcome to show their view on the draft TP.

**Q3.1: Do companies agree to add the draft TP (R2-2100459) to TR?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments or TP suggestions** |
| Apple | Yes | We are ok with adding the results to the TR. |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes | It was agreed that: Power consumption analysis can be put in an Annex of the TR. We are OK to include all reasonable simulation results in the TR. |
| ZTE | Yes with comments | As response to Q1.5, we think the simulation on serving cell results based on the assumption that NO neighbour cell relaxation is performed. So we suggest to highlight this point to the background part.In addition, The TP says:Ø By increasing measurement period 4 times for RRC\_Connected Ues, 11.1% - 26.6% power saving gains are observed, at the cost of 0.26% raise in handover failure rate for stationary or low mobility (e.g., 3km/h) case.Actually, according to Power Saving TR, in this case the HOF rate for stationary/low mobility scenario would go from 0% to 0.26%, strictly speaking, it is not 0.26% raise. So the wording has to be changed into “at the cost of an increase of HOF rate from 0 to 0.26%...”.[vivo] Thanks for pointing it out. We are fine to make it more clear in the assumption that “No neighboring cell relaxation is performed”. |
| Lenovo | Yes | The results could be added. |
| OPPO | Yes |  |
| LG | Yes | We are fine with the TP. |
| CATT | Yes but | We think the simulation results with WUS should be removed as this is more RAN1ish and is not directly related to the RRM performance.[Rapp] Seems it is ok to keep it. As commented by Ericsson, a Note can be added to avoid misunderstanding.  |
| Ericsson | Yes with comments | We are fine in principle. 2 of the 3 cases however apply WUS and it is not clear whether this will be applicable, but it should be fine with the Note. The observation should be clarified however so it is clear there are dependencies.[Rapp] Will add a Note, “FFS if WUS is applicable to Redcap devices”[vivo] We are fine to add this Note. It should be clarified what “true stationary” UE refers to: Does it mean the RSRP and (all) channel conditions stay static all the time? Any assumptions that go along with this propert?[Rapp] Suggest TP rapporteur to clarify this aspect. [vivo] “True stationary” UEs is modeled in the simulation as true fixed scenario, which is the Level-1 we discussed in email discussion in R2-2009364, e.g. it could be based on the deployment scenario.For the E.x.2 it should be clearly mentioned the results come from Power saving SI TR 38.840. [Rapp] Ok. |
| Nokia | Yes |  |
| MediaTek | Yes with comments | The impact on PDCCH and PDSCH decoding as a result of not monitoring SSBs are not captured in the simulation. This must be clarified in the TP.[Rapp] Ok. |
| Futurewei | Yes |  |
| Qualcomm | Yes | We can agree to include the TP in an annex of the TR (as reminded by vivo).  |
| NEC | Yes  |  |
| Xiaomi | Yes |  |
| Intel | Yes |  |
| Thales | Yes |  |
| Sequans | Yes, in Annex |  |
| Samsung | Yes |  |

Summary:

Almost all companies agree to capture the simulation results from R2-2100459 to the TR, some companies also suggest to add more clarification sentences. Please find rapporteur’s response above, and the TP is updated accordingly.

**Proposal 11: To capture simulation results of R2-2100459 to TR (take into account the received comments)*.***

For R2-2101461, it proposes to agree on the use case of certain RedCap UEs whose mobility is localized for the lifetime of the UE. And this paper also suggests to capture below observation into the TR:

|  |
| --- |
| * **If the NW is aware of such mobility nature of the RedCap UE, the NW can use this information in allocating resources to the UE (for e.g. paging).**
* **The NW can configure a set of neighbour cells that are the cells likely to be used by the UE during it’s lifetime and the NW can configure the UE to inform the NW in case the UE moves out of these cells**
	+ **In addition, the NW can provide additional thresholds and control other aspects of the UEs mobility (in IDLE/INACTIVE for reselection and in CONNECTED mode for potential handover) to ensure that the UE does not reselect to cells that outside the configured set of neighbour cells.**
	+ **Alternatively, the NW can also prohibit the UE to reselect to other cells than the ones configured by the NW.**
* **The information about the localized mobility can be from the subscription or from the user configuration, and this information can be provided to the core network or can be limited to the RAN.**
 |

Per rapporteur understanding, these are feasible measures that can be considered, but strictly speaking, some bullets are not related to RRM relaxation (e.g. paging resource allocation). However, companies are welcome to show their views to this proposal.

**Q3.2: Do companies agree to add above text to TR? (may not be completely covered in clause 8.4 )**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments or TP suggestions** |
| Apple  | Yes | We thank the rapporteur in including this as part of the discussion. |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| Lenovo | Yes |  |
| OPPO | No | We have similar understanding with rapporteur and some of these are not related to RRM relaxation. RAN2 has not discussed this use case and therefore we are reluctant to capture it in the TP directly.[Apple] We agree that this was not discussed in the post 112e email discussion, and we are trying to bring this discussion to current offline #110 for this meeting, to be included in the TR. |
| LG | Yes |  |
| CATT | Yes, but | As pointed by Rapporteur, some bullets are not related to RRM relaxation. We wonder whether to include it and where to put the description if agreed.[Apple] We tried to address this in draft TR\_v2\_Apple, and hope the proposed text is ok. |
| Ericssson | No without further clarification | We think such a solution brings additional complexity for both the UE and the network side, and is a bigger feature than just RRM relaxation as commented by rapporteur. Also, the details are not fully clear:* How is the network made aware of “mobility nature of the RedCap UE”. Is this based on NW understanding or something else?

[Apple] As an example, it can be provided to the NW at msg5 during registration or by other means (UE is programmed with such by the use for eg), and the NW can use this info to control UE’s IDLE/INACTIVE re-selection when the UE moves out of CONNECTED mode. * Perhaps one option can be for the UE to provide assistance information to NW to configure such a feature.

[Apple] agree this is another option as well* Not clear how e.g. paging resource optimization should work and interaction with eDRX

[Apple] If the NW can control the UE’s re-selection actions in IDLE/INACTIVE based on this confined mobility, the NW has the knowledge of the UE’s location that can be used effectively at paging the UE.* Likely results in additional overhead in signaling and complexity from UE side to apply new different thresholds, possibly on top of new thresholds for determining whether UE is stationary or not (i.e on top of the other suggested options in this discussion, if this is the intention?) => added complexity for both UE and NW side

[Apple] We agree and have listed this as part of Cons.* What would the actual gains be and what kind of scenarios would really benefit from such feature?

[Apple] the gains from RRM relaxation of stationary mobiles can also be applicable to confined mobility UEs, where the confined mobility UEs are allowed/expected to re-select more than strictly stationary devices. Infact, we view these confined mobility UEs as a type of stationary devices, and the proposed draft TR text reflects this. Additional gains are possible at the NW in effective paging. [Rapp] Suggest contribution rapporteur to clarify a bit more. All in all, we think such feature would require further considerations and is out of scope for the current SID.[Apple] RedCap UEs of the industrial sensor type have potential to be under confined mobility type, and so we do not see that this is out of the scope of SID.If the text is agreed to be adopted in TR, further editorial updates should be made and preferably specification impact analyzed as well.[Apple] Pls see our draft TR text proposals for editorial updates. |
| Nokia | Yes |  |
| MediaTek | No | We are reluctant to capture this in the TR as we have not discussed this in the SI.[Apple] We agree that this was not discussed in the post 112e email discussion, and we are trying to bring this discussion to current offline #110 for this meeting, to be included in the TR. |
| Futurewei | Yes |  |
| Qualcomm | Yes | We agree with the observations in principle. But like some other companies have pointed out, we need to discuss how (which part of the text and in which section) to include the TP. [Apple] We request to check the draft TR text proposal for this. |
| NEC | Yes, but | Further clarifications are needed, as Ericsson pointed out. |
| Intel | No | As pointed by Ericsson and other companies, we did not discuss it before, the details are unclear and some of them are unrelated to RRM measurement relaxation. In addition, I assume below solution is the enhancement on how to determine UE’s moment state?* **The NW can configure a set of neighbour cells that are the cells likely to be used by the UE during it’s lifetime and the NW can configure the UE to inform the NW in case the UE moves out of these cells**

[Apple] The UE can be programmed to always report the confined mobility state (typical for industrial sensors) and in such a case, there is no additional logic at the UE to detect this.We agree that this was not discussed in the post 112e email discussion, and we are trying to bring this discussion to current offline #110 for this meeting, to be included in the TR |
| Thales | No | In general we think this goes into the right direction. However, as pointed out by some other companies, some of the rapporteur proposals need further discussion prior we should include in the TR as such. E.g. “**NW is aware of such mobility nature of the RedCap UE”,** certain use cases such as tracking may change when stored in a warehouse and when moving. How such scenarios to be handled. There are several aspects which require further discussion prior agreeing.[Apple] We request to check the draft TR text proposal for this. Also pls check the responses above for the concerns listed. |
| Sequans | No | At least, not as is. We agree with comments above, and this should be further discussed before introduction to TR [Apple] We request to check the draft TR text proposal for this. Also pls check the responses above for the concerns listed. |
| Samsung | Yes |  |

Summary:

11 companies agree to capture the observation 1 (from R2-2101461) to the TR. And 6 companies disagree, because they thinks the technical points haven’t been discussed in RAN2 before, and some are not related to RRM relaxation. Rapporteur understand if network can obtain the mobility property of UE, then the described NW behaviour could be considered for the purpose of e.g. avoiding unexpected mobility.

However, as commented by other companies, it is still unclear where/how to capture these aspects? So rapporteur would suggest to further discuss whether/how to capture this to TR. And contribution rapporteur (Apple) is encouraged to provide your views and potential TP suggestions.

**Proposal 12: To further discuss whether and how to capture the observation 1 from R2-2101461 to TR*.***

For R2-2101257, it is requested to add simulation results to the TR, including the simulation results for power saving gain achieved by further expanding the measurement interval and reducing measurement time for neighboring cell RRM measurement relaxation in RRC\_IDLE/INACTIVE. Companies are welcome to show their view on the draft TP.

**Q3.3: Do companies agree to add the draft TP (R2-2101257) to TR?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments or TP suggestions** |
| Huawei, HiSilicon | Yes | Proponent. |
| Vivo | Yes | We are OK to include all reasonable simulation results in the TR. |
| ZTE | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| LG | Yes |  |
| CATT | Yes |  |
| Ericsson | Yes | Fine in principle. Is the intention to add this is Annex and refer from the body text, as has been done for other analyses? |
| Nokia | Yes |  |
| MediaTek | Yes, but | We are open to include the simulation results in the TR. However the associated text in section 8 of the TR is not needed as it has been covered in part 1 and 2 of this email discussion. |
| Futurewei | Yes |  |
| Qualcomm | No | We don’t agree including the 1st and 2nd change in the body text, which referably should consist of mostly agreements or issues that have been discussed, not views from a particular company that has not been discussed. We’d like to suggest moving the 1st and 2nd change to the annex to be together with the 3rd change. [Rapp] Yes, the intention is to only capture simulation results to the TR. |
| NEC | Yes  |  |
| Xiaomi | Yes |  |
| Intel | Yes |  |
| Thales | Yes |  |
| Sequans | Yes, in Annex |  |
| Samsung | Yes |  |

Summary:

There is consensus to capture the simulation results from R2-2101257 to TR.

**Proposal 13: To capture simulation results from R2-2101257 to TR *.***

# Phase 2 discussion

* [AT113-e][110][REDCAP] RRM relaxations (ZTE)

Updated scope: Continue the discussion on p8 and the TP in p12 from [R2-2102020](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2102020.zip). Also discuss p3 from [R2-2102019](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2102019.zip) (report of offline [109])

Updated intended outcome: Summary of the offline discussion with e.g.:

* + - List of proposals for agreement
		- Corresponding TP for the TR

Deadline (for companies' feedback): Wednesday 2021-02-03 11:00 UTC

Deadline (for rapporteur's summary in R2-2102038): Wednesday 2021-02-03 13:00 UTC

Based on the update scope of offline-110, we will continue the discussion on P8 and TP for p12, as well as P3 from offline-109. Please see corresponding questions below:

|  |
| --- |
| **Proposal 8: Capture in TR the following solutions to assist triggering neighbour RRM relaxation in RRC\_CONNECTED.** **• Solution 1: UE reports “stationary” status to network in Msg5;** **• Solution 2: Network provides (e.g. low mobility, not-at-cell-edge) evaluation parameters to UE via dedicated signalling;** **• Solution 3: AMF sends “stationary” indication to gNB (based on UE subscription);** **• Solution 4: UE reports “stationary” in UE Assistance Information to network;** |

There was a comment asking to clarify, is the intention that the potential triggering for RRM relaxation would be controlled by the NW? For instance, when network receives “stationary” indication from UE/AMF (e.g. solution 1/3/4), is it possible that network/gNB wants that the UE continues with normal RRM procedures.

Although the detailed RRM relaxation method will be defined by RAN4, rapporteur understands that for solution 1/3/4, the RRM relaxation will be performed after receiving explicit network indication (after sending “stationary” indication). So it is not performed autonomously after sending the “stationary” indication. And this should already be expressed by the wording “to assist”.

So companies are welcome to show your views to Proposal 8.

**Q6.1: Do companies agree with above Proposal 8 (if no, please provide your comment and suggested wording)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments** |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Intel | Yes |  |

For P12, concerned company (Apple) already provided draft TP to FTP folder (contained in latest TP version).

|  |
| --- |
| **Proposal 12: To further discuss whether and how to capture the observation 1 from R2-2101461 to TR*.*** |

**Action 6.2: Company who has comments to the draft TP of P12, please provide your comments directly to the draft TP in FTP folder. (Please add comment bubbles, do not modify the TP content directly)**

For below Proposal 3 from the summary of offline-109 (R2-2102019):

|  |
| --- |
| **Proposal 3 (18/21): Capture in the TR that it is recommended to support eDRX value up to 10485.76 s.** |

Based on online discussion, one company shows strong concern, and think support of this proposal is related to the support of serving cell measurement outside PTW. If UE is required to measure serving cell outside PTW, then there is no need to support eDRX up to 10485.76s.

In LTE eDRX, RAN4 has defined requirement that UE is not required to perform serving cell RRM outside PTW (regardless of the upper bound for the eDRX cycle is 2621.44s or 10485.76s). Based on companies’ comment, it seems companies (except one) have the common understanding that the similar LTE RRM requirement will be applied to NR eDRX as well, and this is RAN4’s work.

In addition, rapporteur would like to repeat the online comment, that RRM requirement for eDRX is different from RRM relaxation. Because such RRM requirement applies to all Redcap UEs that configured with eDRX, not limited to “stationary” Redcap UEs.

Based on above, companies are welcome to show your views to Proposal 3:

**Q6.3: Do companies agree with above Proposal 3 (if no, please provide your comment)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments** |
| ZTE | Yes |  |
| Qualcomm | Yes | Maybe we can reword the proposal as follows, to help address the concern by the opponents:**Capture in the TR that it is recommended to support eDRX value up to 10485.76 s, unless RAN4 confirms such eDRX value requires UE to perform RRM on serving cell outside PTW.** |
| Intel | Yes | Agree Qualcomm ‘s rewording. |

Regarding how to trigger other WG (i.e. RAN4) to define RRM requirement for eDRX case, per rapporteur’s understanding, this relates to the discussion on the scope of WID. For example, to add the following bullet to the objective of WID:

* Define RRM requirement for eDRX in RRC\_IDLE and RRC\_INACTIVE [RAN4]

(Note that not only serving cell measurement, RAN4 also needs to define intra-frequency, inter-frequency measurement requirements for eDRX case).

The scope of WID is expected to be discussed in RANP, so it is unclear whether we should make agreement right now in RAN2 on this aspect. Rapporteur understand it is naturally that companies will bring contribution to RANP to add this objective to the WID. Of course, companies are welcome to show your views on this aspect.

**Q6.4: Do companies agree in NR, RAN4 needs to define serving cell, intra-frequency, inter-frequency RRM requirements for eDRX case?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree****(Yes or No)** | **Comments** |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Intel | Yes |  |

**Q6.5: Views on how to trigger RAN4’s discussion?**

* **Alt 1: Discuss the objective of WID in RANP;**
* **Alt 2: RAN2 should make agreement on this (and send LS?)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Alt 1 or Alt 2** | **Comments** |
| ZTE | Alt 1 | We see no benefit of Alt-2, the scope of WID (related to other WG) can be (and anyway will be) discussed in RANP, and we see no risk of not agreeing this item.  |
| Qualcomm | Neutral | Either Alt 1 or 2 is fine with us, assuming Alt 2 means RAN2 first discuss triggers for RRM relaxation and then send LS to RAN4 requesting them to discuss methods for relaxation. |
| Intel | Alt1/2 | Alt 1 is needed since anyway the scope should be discussed in RANP;If eDRX is contained in the scope, RAN2 should make agreements first, and then send LS to RAN4.  |

# Summary- Phase 1

*List of proposal for agreements:*

**Proposal 1: For measurement relaxation methods, RAN2 can discuss preferable solutions, but RAN4 should be consulted before making the final decision.**

**Proposal 8: Capture in TR the following solutions to assist triggering neighbour RRM relaxation in RRC\_CONNECTED.**

**• Solution 1: UE reports “stationary” status to network in Msg5;**

**• Solution 2: Network provides (e.g. low mobility, not-at-cell-edge) evaluation parameters to UE via dedicated signalling;**

**• Solution 3: AMF sends “stationary” indication to gNB (based on UE subscription);**

**• Solution 4: UE reports “stationary” in UE Assistance Information to network;**

**Proposal 9: Capture in TR the potential solutions for neighbour cell RRM relaxation methods in RRC\_CONNECTED. The exact mechanism, if any, should be decided by RAN4. From RAN2’s perspective, other solutions are not precluded (e.g. network does not configure measurements for mobility purpose, UE only performs measurement on single RS type).**

**Proposal 11: To capture simulation results of R2-2100459 to TR (take into account the received comments)*.***

**Proposal 13: To capture simulation results from R2-2101257 to TR *.***

*List of proposals that require online discussions:*

**Proposal 7: To online discuss the following options:**

* **Alt 1: Add a recommendation in the conclusion of the TR that, compared to RRC\_IDLE/INACTIVE, neighbour cell RRM relaxation in RRC\_CONNECTED can be considered with lower priority.**
* **Alt 2: Not to add any recommendation for neighbour cell RRM relaxation in the conclusion of the TR (The prioritization between RRM relaxation in RRC\_IDLE/INACTIVE and RRM relaxation in RRC\_CONNECTED, if any, will be decided by RANP).**

**Proposal 10: Add a recommendation in the conclusions of the TR that irrespective of RRC state, serving cell RRM relaxation for Redcap UEs is not considered in Rel-17 (This does not impact RAN4 to define RRM requirement for eDRX case)*.***

**Proposal 12: To further discuss whether and how to capture the observation 1 from R2-2101461 to TR*.***

# Reference

1. R2-2100569 Report of Email discussion[155][REDCAP] RRM relaxations ZTE Corporation, Sanechips discussion Rel-17 FS\_NR\_redcap

*endorsed TP*

1. R2-2100984 RAN2 update to TR38875 Ericsson discussion FS\_NR\_redcap