3GPP TSG-RAN WG2 #117 R2-220xxxx

eMeeting, 21st February - 3rd March, 2022

Agenda Item: 8.0.3

Source: MediaTek Inc.

**Title: Report of [AT117-e][039][NR17] Gaps Coordination (MediaTek)**

Document for: Discussion and decision

# 1 Introduction

This is report for the following AT117-e mail discussion.

* [AT117-e][039][NR17] Gaps Coordination (MediaTek)

Scope: Take into account [R2-2202985](file:///C:\Users\johan\OneDrive\Dokument\3GPP\tsg_ran\WG2_RL2\TSGR2_117-e\Docs\R2-2202985.zip), [R2-2203446](file:///C:\Users\johan\OneDrive\Dokument\3GPP\tsg_ran\WG2_RL2\TSGR2_117-e\Docs\R2-2203346.zip), [R2-2202864](file:///C:\Users\johan\OneDrive\Dokument\3GPP\tsg_ran\WG2_RL2\TSGR2_117-e\Docs\R2-2202864.zip), [R2-2202888](file:///C:\Users\johan\OneDrive\Dokument\3GPP\tsg_ran\WG2_RL2\TSGR2_117-e\Docs\R2-2202888.zip), [R2-2202943](file:///C:\Users\johan\OneDrive\Dokument\3GPP\tsg_ran\WG2_RL2\TSGR2_117-e\Docs\R2-2202943.zip), [R2-2202209](file:///C:\Users\johan\OneDrive\Dokument\3GPP\tsg_ran\WG2_RL2\TSGR2_117-e\Docs\R2-2202209.zip), [R2-2202321](file:///C:\Users\johan\OneDrive\Dokument\3GPP\tsg_ran\WG2_RL2\TSGR2_117-e\Docs\R2-2202321.zip). Identify points for coordination that seems immediately agreeable. Determine whether LS out to RAN4 is needed, and if so, converge on an LS. Lower priority: can also attempt to identify Open Issues that may be helpful for further work in Q2.

Intended outcome: Report, Approved LS out if applicable

Deadline: Friday W1 (for immediately agreeable coord points, and LS out), EOM: remaining parts if any.

Deadline – Friday W1 end of your business day

The agreement form last meeting is copied below for reference.

* Continue to discuss each gap feature in individual WI with the following understandings.

- Whether to support MAC CE activation/deactivation of the gap is discussed independently in each WI. There is no need to have common MAC CE framework.

- RRC configuration for gap feature could be progressed separately in each WI. However, RAN2 may use common RRC configuration structures for different gaps once the relation between each gap feature is clear.

* On gap coordination, RAN2 to attempt conclusion from R2 point of view on the following aspects (no limitation is intended).

- Could gap features be configured together? Is there any collision on procedure part when more than one is configured? (to identify the possible gap combinations)

- How many gaps could be configured / activated at the same time? IS there any R2 related limitation or does RAN2 have to consult RAN4 for this number?

- Expect to send LS to R4 after initial R2 conclusions (next meeting)

* R2 assumes that UL FR2 gap is independent from other gap features. (i.e. separate configuration for UL FR2 gap and enabling the UL FR2 gap or not does not conflict with other gap features from RAN2 perspective).
* RAN2 assumes that the detailed UE behaviour while gaps are overlapped in time domain is R4 knowledge, e.g. which use case has priority (if such is needed)

The rapporteur does not really find any “easy agreement” based on the companies’ contributions. But anyway, we will collect more views and see whether we have to send an LS to RAN4.

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

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| --- | --- | --- |
| Company | Name | Email Address |
| MediaTek (Rapp) | Felix Tsai | chun-fan.tsai@mediatek.com |
| OPPO | Jiangsheng Fan | fanjiangsheng@oppo.com |
| Intel (Rapp) | Candy Yiu | Candy.yiu@intel.com |
| vivo | Xiaodong Yang | Yangxiaodong5g@vivo.com |
| Huawei, HiSilicon | Lili Zheng | zhenglili4@huawei.com |
| Ericsson | Felipe Arraño Scharager | felipe.arrano.scharager@ericsson.com |
| CATT | Jie Shi | shijie@catt.cn |
| Qualcomm | Mouaffac | [mambriss@qti.qualcomm.com](mailto:mambriss@qti.qualcomm.com) |
| Nokia, Nokia Shanghai Bell | Tero Henttonen | tero.henttonen@nokia.com |
| Samsung | Sangyeob Jung | sy0123.jung@samsung.com |
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# 3 Discussion

## 3.1 Joint Configuration (R2 point of view)

In this section, we discussed the following question from last meeting

* On gap coordination, RAN2 to attempt conclusion from R2 point of view on the following aspects (no limitation is intended).

- Could gap features be configured together? Is there any collision on procedure part when more than one is configured? (to identify the possible gap combinations)

The following are related proposals from companies.

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| **Companies** | **Proposals** |
| ZTE [1] | Proposal 2: For gap configuration procedure:   Aperiodic gap from MUSIM is discussed independently in MUSIM session;   NTN gap can be considered after NTN session (RAN2/4) concludes the NTN gap design principles. |
| Ericsson [2] | Proposal 1 From an RRC signalling design point of view, RAN2 aim to support joint working among different gap features (e.g., MGE, ePOS, MUSIM, NTN, etc.).  Proposal 2: RAN2 will not define requirements for when/how different gap features can be simultaneously configured (e.g., MGE, ePOS, MUSIM, NTN). |
| MediaTek [3] | Proposal 1: RAN2 confirms that MUSIM gap can be configured simultaneously with MGE or ePOS gaps. There is no conflict in RAN2 procedure. Whether to have specific UE behavior while there is time domain overlapping between MUSIM gap and other gaps is up to RAN4.  Proposal 2: RAN2 assumes that ePOS gap can be configured simultaneously with MGE or legacy gaps with the following understanding.   Simultaneous configuration is only allowed for UE supports concurrent gap and ePOS gaps is counted as one per UE gap in concurrent gap operation (i.e. subject to maximum number of concurrent measurement gaps defined by RAN4)   While ePOS gap is configured, MGE gap or legacy gap is NOT used for PRS measurement. The network should NOT associate any concurrent gap to PRS measurement. |
| Huawei [4] | Proposal 1: In Rel-17, NTN and enhanced positioning will not be configured simultaneously.  Proposal 2: In Rel-17, joint configuration of MUSIM and NTN/Positioning/MGE is not considered.  Proposal 3: The joint configuration of Positioning and MGE is allowed. The joint working of Positioning and concurrent MG is discussed in MGE WI, and the joint working of Positioning and pre-configured MG can be discussed in this AI after individual WI CRs are ready. |
| Samsung [5] | Proposal 1: Specify that ePOS gap is considered as part of MGE concurrent gap.  Proposal 2: Decouple MUSIM gap with MGE concurrent gap.  Proposal 3: Decouple NTN gap with MGE concurrent gap.  [Rapp] By decoupling, rapporteur understands that it implies joint configuration is supported. There will be no special limitation/restriction defined in R2 SPEC.  [Samsung] The intent was to have separate RRC configuration for MUSIM gap/NTN gap and MGE gap ☺ |
| OPPO [6] | Proposal 2: Define a separate IE for MUSIM gap, i.e. Gap design coordination will not consider MUSIM gap.  Proposal 3: More clarifications from RAN4 are still needed if gap design coordination wants to consider R17 NTN gaps. |

From the contributions, it seems that main discussion is the co-exist between non-MGE gaps (MUSIM, NTN, ePOS) and MGE gaps. We will check companies view one by one. Please note that this is **from RAN2 functional aspect**. Time domain overlapping and maximum number of configurations is related to RAN4. No need to discuss in this section.

For NTN gap, it seems that we have 3 different view from the proposals.

**Question 1: Companies are invited to provide their views on co-existence between NTN and other gap features**

* **Option 1 – Joint configuration for NTN and other gap feature is supported**
* **Option 2 – Joint configuration for NTN and other gap feature is NOT supported**
* **Option 3 – We wait for more progress on NTN**

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| **Company** | **Preferred option** | **Comments** |
| MediaTek | Option 3 | We are actually not clear on what would be the new functionality for NTN gap (if there is one). So, we prefer to wait. |
| OPPO | Option 3 | How NTN gap will be defined is still under discussion in NTN session, at least clarifications for the following issues are still needed if our intention is to have joint configuration for NTN and other gap feature:  Issue1: How many NTN gap will be introduced, i.e. one or more than one NTN gap; more addition, one NTN gap with more than one offset will be considered as one gap or more than one gap?  Issue2: If the maximum NTN gaps exceed the maximum gap limitation defined for concurrent gap, how to consider the gap coordination, needs RAN4 inputs or not?  Issue3: If implicit mapping rule is defined between per SMTC per MO configuration and NTN gap, how to consider gap signalling coordination while concurrent gap uses explicit assignment between MO configuration and concurrent gap?  Too many issues unclear if joint configuration for NTN and other gap feature is supported, Option3 is what we can do for now. |
| Intel | Option 3 | Wait for more progress on NTN and RAN4 on requirement on joint configuration. But it seems like NTN will not discuss gap issue in this meeting due to lack of time. |
| vivo | Option 3 | We have the sympathy with intel.  From signalling and procedure point of view, we do not see the restriction. |
| Huawei, HiSilicon | Option 3 | Same view as Intel, no agreement on NTN gaps is cooking in this meeting.  In our understanding, at least NTN and positioning enhancement should not be enabled simultaneously. |
| Ericsson | Option 3 |  |
| CATT | Option 3 | Since the definition of NTN gap is still not clear, we are fine to wait the progress in NTN topic. |
| Qualcomm | Option-2 | To avoid delaying the other gap features, decoupling them from NTN gap is necessary to move forward with the other gap features. |
| Nokia, Nokia Shanghai Bell | Option 3 | Let's wait for NTN to finalize. |
| Samsung | Option 3 |  |
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Summary:

**Proposal 1:**

For MUSIM gap, one company think MUSIM gap cannot be configured together with NTN/Positioning/MGE. Most companies seems consider MUSIM gap as independent from other gap and joint configuration is possible.

**Question 2: Companies are invited to provide their views on co-existence between MUSIM and other gap features. Do companies agree to support joint configuration between MUSIM gap and other gap features from RAN2 perspective (i.e. RAN2 assumes no conflict between MUSIM and other gap features)?**

*Note: Whether to merge the periodic MUSIM gap configuration to concurrent gap ASN.1 configuration structure is* ***NOT*** *related to Q2. Joint configuration could be done by either same filed or different field.*

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| **Company** | **Agreed or not** | **Comments** |
| MediaTek | Yes | We do not find any dependence on MUSIM gap with other gap. There may be time domain overlapping on gap duration or limitation on number of active gaps. However, that is more RAN4 domain. Even RAN4 does not define any joint requirement, it would be fine for RAN2 to support the joint configuration from signaling point of view. |
| OPPO | Yes | Similar view as MediaTek. |
| Intel | Yes | We think MUSIM can be configured jointly with other gaps. But RAN4 will needs to provide more input on requirement such as total activated configured gap per UE etc. |
| vivo | Yes | Agree with MTK. |
| Huawei, HiSilicon |  | From signalling perspective the joint working is possible. But since RAN4 agreed that there will be no requirements for MUSIM in Rel-17, let alone combinations of MUSIM and other features, we think joint configuration of MUSIM and other features should not be considered in this release. |
| Ericsson | Yes |  |
| CATT | Yes | For the periodic MUSIM gap configuration, the joint configuration between MUSIM gap and other gap features could be supported. |
| Qualcomm | Yes | No harm if both gaps co-exist.  For time domain overlap between the 2 gaps, no need to check with RAN4, it can be left to UE implementation. |
| Nokia, Nokia Shanghai Bell | Yes | At least a single "legacy" measurement gap needs to be supported with MUSIM gaps to avoid impacts to NW A measurements. |
| Samsung | Yes |  |
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Summary:

**Proposal 2:**

For ePOS gap, the proposals are more complicate. As ePOS gap and MGE gap are both used for measurement, there seems so correlation on the two feature. It is not also unclear that whether ePOS gap should be one of concurrent gap.

**Question 3: Companies are invited to provide their views on co-existence between ePOS and other gap features. Do companies agree to support joint configuration between ePOS gap and other gap features from RAN2 perspective (i.e. RAN2 assumes no conflict between ePOS and other gap features)?**

*Note: Whether to merge the ePOS gap configuration to concurrent gap ASN.1 configuration structure is* ***NOT*** *related to Q3. Joint configuration could be done by either same filed or different field.*

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| **Company** | **Agreed or not** | **Comments** |
| MediaTek | Yes, but | We think ePOS gap is overlapped with MGE concurrent gap from functional point of view. We propose to support joint configuration with the following limitation.  <1> If ePOS gap is configured, there should be no association of PRS measurement to concurrent gap.  <2> ePOS gap should be counted as one of per UE gap for the concurrent gap limitation defined by RAN4  In our understanding, there will two kind of new positioning gap (gap that used for PRS measurement only) in R17. One from ePOS gap and is activated/deactivated by MAC CE. The other from MGE and is always activated while configured. Those two cannot be configured together. |
| OPPO | Yes, but | Tend to share the rapporteur’s comments but also think bullet <2> above should confirm with RAN4. |
| Intel |  | In our understanding, PRS configured within concurrent gap will be same as the legacy PRS (Rel16). It will be always activated. The pre-configured gap that will be activated/deactivated by MAC CE for ePOS will be a separate feature for PRS measurement. We think that they can be configured simultaneously as long as the total number of activated gaps are under the max gap UE support or defined by RAN4 and the total number of pre-configured gap (may not be activated at the same time) are under the max number defined. |
| vivo | Yes | We agree with intel. |
| Huawei, HiSilicon | No | At least not combined with NTN. |
| Ericsson | Yes, but | We first need to discuss on the Rapporteur’s comment above or other possible issues. |
| CATT | Yes | CATT think the joint configuration between ePOS gap and other gap features works from RAN2 perspective.  But CATT have concern on the limitation <1> proposed by MTK, because even if the ePOS MG is configured to UE, the concurrent gap still can work as legacy MG for PRS. There are two options to measure the PRS: ePOS gap or legacy MG (Rel-16).  There is a procedure how to activate the ePOS gap by MAC CE triggered by pre-conditions which is under discussion in POS WI. So we think those two can be configured together, and one ePOS is activated by MAC CE within conditions. |
| Qualcomm | Yes | Share same views are rapporteur, in addition RAN4 needs to provide the priority requirement when time domain overlap occurs between ePOS and MGE gaps. |
| Nokia, Nokia Shanghai Bell | Yes but | We also agree that ePOS gap should be counted as one of the concurrent gaps. RAN1 also thought that ePOS gap could be a pre-configured gap. |
| Samsung | Yes but | We agree with two bullets <1> and <2> indicated by MediaTek |
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Summary:

**Proposal 3:**

## 3.2 LS to RAN4

In this section, we discussed the following question from last meeting

* On gap coordination, RAN2 to attempt conclusion from R2 point of view on the following aspects (no limitation is intended).

- How many gaps could be configured / activated at the same time? IS there any R2 related limitation or does RAN2 have to consult RAN4 for this number?

- Expect to send LS to R4 after initial R2 conclusions (next meeting)

The following are companies proposals related to maximum number of configured gap and LS to RAN4.

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| **Companies** | **Proposals** |
| ZTE [1] | Proposal 5: The number of gaps that can be configured in parallel will be captured in field description after receives RAN4’s inputs. |
| Ericsson [2] | Proposal 3 Ask RAN4 how many gap-related features could be configured simultaneously and what is the set of allowed combinations. |
| MediaTek [3] | Proposal 6: For gap used for measurement, the maximum number of activated gaps is limited by limitation of concurrent gap defined by RAN4.  Proposal 7: LS to RAN4 to check whether the understanding in P6 is correct. In addition, ask RAN4 whether there is limitation on maximum number of configured MUSIM and measurement gaps. |
| Huawei [4] | Proposal 4: Total number of multiple gaps configured to the UE (regardless of the features enabled or the purpose of gaps) shall not exceed the limitation set in the MG enhancement WI for concurrent MGs. RAN4 confirmation is needed. |
| Samsung [5] | Proposal 4: From RAN2 perspectives, MUSIM gap/ NTN gap/ MGE concurrent gap are configured independently. Send an LS to RAN4 to ask whether there is any restriction on the maximum number of gaps to be configured/activiated at the same time. |
| OPPO [6] | Proposal 3: More clarifications from RAN4 are still needed if gap design coordination wants to consider R17 NTN gaps. |
| VIVO [7] | Proposal1: The max gap features which are configured simultaneously shall be limited to 3 or 4. The UE shall report the UE capability of max gap features which are configured simultaneously.  Proposal2: The max gap number which are configured simultaneously shall be limited to 8 from RAN2 point of view. |

From the proposals, it seems that most companies want to ask R4 at least on maximum number of configured gaps.

**Question 4: Do companies agree to send LS to RAN4 on gap coordination in this meeting ? If yes, what should we inform R4 and what should we ask R4?**

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| **Company** | **Agreed or not** | **Comments** |
| MediaTek | Yes | Information to R4  <1> RAN2 signaling will in general support joint configuration for all gap features  <2> RAN2 assumes that the detailed UE behaviour while gaps are overlapped in time domain is R4 knowledge, e.g. which use case has priority (if such is needed)  <3> RAN2 understanding on joint configuration between ePOS gap and MGE gap (depends on result of Q3)  Question to R4  <1> Whether there is restriction on joint configuration of some gap features from R4 perspectives  <2> The total number of gaps that could be configured to the UE. |
| OPPO | Yes | At least includes the following:   1. RAN2 assumes that the detailed UE behaviour while gaps are overlapped in time domain is R4 knowledge, e.g. which use case has priority (if such is needed); 2. RAN2 may use common RRC configuration structures for different gaps once the relation between each gap feature is clear, but wants to know further that is there any collision on procedure part when more than one is configured from RAN4 perspective? (to identify the possible gap combinations); 3. How many gaps could be configured / activated at the same time? Is there any R2 related limitation or does RAN2 have to consult RAN4 for this number? 4. Whether ePOS gap should be counted as one of per UE gap for the concurrent gap limitation defined by RAN4? |
| Intel | Yes | * RAN2 agreement (if want to reduce, include at least what gaps RAN2 support) * Ask RAN4 on joint operation of gaps * Ask RAN4 on max gaps and if it is based on UE capability |
| vivo | Yes | Some changes based MTK inputs  Information to R4  <1> RAN2 signaling will in general support joint configuration for all gap features  <2> RAN2 assumes that the detailed UE behaviour while gaps are overlapped in time domain is R4 knowledge, e.g. which use case has priority (if such is needed)  Question to R4  <1> Whether there is restriction on joint configuration of some gap features from R4 perspectives, or max gap features configured simultaneously based on UE capability.  <2> The total number of gaps that could be configured to the UE. |
| Huawei, HiSilicon | Yes | Same view as Intel. |
| Ericsson | Yes | A mix of what has been added above, i.e.:  - Info: RAN2 agreements for this activity + useful agreements from concerning Rel-17 WIs addressing gaps  - Ask: requirements for when/how different gap features are simultaneously config. (i.e., set of allowed combinations) + max. number of these features configured together |
| CATT | Yes | -Ask RAN4 on the maximum number of gap that could be configured jointly  -Ask RAN4 on the set of possible combination of different gap type  -Ask RAN4 on the UE behaviour if multiple gap types are overlapped in time domain |
| Nokia, Nokia Shanghai Bell | Yes but | The number of gaps clearly needs input from RAN4.  Otherwise, if we send LS to RAN4, it should be to just ask if RAN4 sees issues with the RAN2 decisions. RAN4 doesn't have TUs to do much anyway.  Note that RAN4 has already been discussing the MUSIM gaps, and is expected to finalize their work on those in the ongoing meeting. |
| Samsung | Yes | Same view as Intel. |
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Summary:

**Proposal 4:**

## 3.3 RRC Signaling and others

There are some proposals on ASN.1 details of gap configuration. Rapporteur thinks it will be difficult to go into this part. It is suggested follow the previous agreement to progress individually and may merged later.

* Continue to discuss each gap feature in individual WI with the following understandings.

- Whether to support MAC CE activation/deactivation of the gap is discussed independently in each WI. There is no need to have common MAC CE framework.

- RRC configuration for gap feature could be progressed separately in each WI. However, RAN2 may use common RRC configuration structures for different gaps once the relation between each gap feature is clear.

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| **Companies** | **Proposals** |
| ZTE [1] | Proposal 3: Use “ToAddModList” and “ToReleaseList” structure to support configuring multiple gaps, it provides periodic gap configuration for concurrent gaps, ePos pre-configured gaps and MUSIM. |
| MediaTek [3] | Proposal 4: Use separate RRC configuration for MUSIM gap and MGE gaps. There is no need to define MUSIM gap as one of concurrent gap (with purpose MUSIM) in ASN.1 structure.  Proposal 5: Use separate RRC configuration for ePOS gap and MGE gaps. |
| OPPO [6] | Proposal 2: Define a separate IE for MUSIM gap, i.e. Gap design coordination will not consider MUSIM gap. |

Nevertheless, companies could still provide comment on RRC signaling or any other comment on gap coordination.

**Question 5: Any other comment on gap coordination that companies want to discuss in this meeting?**

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| **Company** | **Comments** |
| OPPO | As for MUSIM gap, the gap signalling design coordination with other gaps is not beneficial. The concerns are listed below:   * **MUSIM gap is not only used for measurements, putting MUSIM gap IE into the legacy IE *MeasGapConfig* is a little bit strange.** * **Apart from periodic gaps, MUSIM gap also includes aperiodic gap, which is not supported by other type of gaps.** * **Putting MUSIM gap IE into the legacy IE *MeasGapConfig* needs extra differentiation bit, which will make the *MeasGapConfig* design complex.**   Based on the concerns above, we prefer to define a separate IE for MUSIM gap. |
| Intel | We think once we have endorsed running CR, other WI can check if they can reuse the structure. MGE doesn’t need to further discuss. |
| Nokia, Nokia Shanghai Bell | **AddModReleaseList for gaps:** This really only works if we replace the existing legacy gap configuration, or put all the gaps in the list. Perhaps this could be better considerd once we see the signalling design from each WI?  **MUSIM gaps:** We are fine to have separate configuration for these.  **ePOS gaps:** We think that if the ePOS gaps could be pre-configured gaps or used as one of the concurrent gaps, then they need to be part of pre-configured/concurrent gap configuration one way or another. But there are still open issues in ePOS gaps related to e.g. gap activation and configuration, so we may have to wait for those to finalize. |
| Samsung | We are also fine to have separate configuration for MUSIM gaps. On the other hand, we also think whether to have separate RRC configuration can be discussed later on after looking at the progress of each WI. |
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Summary:

**Proposal 5:**

# 4 Conclusions

Base on the discussion in section 2, we propose the following:

**Proposal 1:**

# 5 References

[1] [R2-2202985](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2202_R2_117-e/Docs/R2-2202985.zip), “Consideration on gaps coordination”, ZTE

[2] [R2-2203446](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2202_R2_117-e/Docs/R2-2203446.zip), “Gaps coordination”, Ericsson

[3] [R2-2202864](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2202_R2_117-e/Docs/R2-2202864.zip), “Discussion on gap coordination”, MediaTek

[4] [R2-2202888](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2202_R2_117-e/Docs/R2-2202888.zip), “Discussion on gaps coordination”, Huawei

[5] [R2-2202943](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2202_R2_117-e/Docs/R2-2202943.zip), “Discussion on gaps coordination”, Samsung

[6] [R2-2202209](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2202_R2_117-e/Docs/R2-2202209.zip), “Consideration for Gaps Coordination”, OPPO

[7] [R2-2202321](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2202_R2_117-e/Docs/R2-2202321.zip), “Discussion on Gap coordination”, vivo