**3GPP TSG-RAN WG2 Meeting #12R2-23xxxxx**

**Chicago, US, 13th – 17th Nov 2023**

Agenda Item: 7.17.2

Source: vivo

Title: Report of [Post123bis][205][MUSIM] RRC Running CR and further discussions (vivo)

Document for: Discussion and Decision

# Introduction

This is the report of the following email discussion:

* [Post123bis][205][MUSIM] RRC Running CR and further discussions (vivo)

**Scope**: Update and review the RRC running CR, also discussions on the RRC open issues based on the progress in this meeting

**Intended outcome**: RRC running CR for endorsement, and discussion report with proposals

**Deadline**: Long (2 weeks for running CR, November 3rd for open issue)

Companies are invited to give feedback on the open issues questionnaire in sections 2.1, 2.2, 2.3, 2.4 and 2.5 by **Wednesday Oct. 25 10:00 UTC**, if possible, to allow report and issues submission for online discussion before official deadline.

**Contact person for each person participating company.**

|  |  |  |
| --- | --- | --- |
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# Discussion

## MN-SN coordination

On MN-SN related coordination, RAN2#123bis meeting agreements below:

* For the proactive approach, the MN can indicate the forbidden/affected band information (for the MUSIM purpose) to the SN. FFS for the reactive case.
* For Rel-18 MUSIM dual active operation, UE indicates its forbidden/affected band combinations (or band(s)) based on the network configured band-filter list, in the UAI signalling to NW A.
* For Rel-18 MUSIM dual active operation, UE signals its temporary capabilities restrictions as forbidden band combinations with band indexed to the band-filter list and/or affected band combinations with band indexed to the band-filter list along with explicit fields for restricted (lower) capabilities e.g. maximum MIMO layers.

According to the above agreement, the forbidden band combinations and/or the affected band combinations with restricted capabilities would be reported in the UAI. Upon reception of this information, the MN may also need to indicate them, i.e., the forbidden/affected band information, to the SN.

In paper R2-2311043, it is suggested that: to indicate the forbidden band entries, the MN can include both the selected band entries by the MN and the forbidden band entries in the existing SelectedBandEntriesMN, so that then the SN would not configure the UE with cells on these band entries.



For example:

 **MN=>SN**:

MUSIM-AffectedBandCombList-r18 ::= SEQUENCE (SIZE (1..maxBandComb)) OF MUSIM-AffectedBandComb-r18

MUSIM-AffectedBandComb-r18 ::= SEQUENCE (SIZE (1.. maxSimultaneousBands)) OF MUSIM-CapabilityRestrictedBandParameters OPTIONAL

selectedBandEntriesMNList SEQUENCE (SIZE (1..maxBandComb)) OF SelectedBandEntriesMN

SelectedBandEntriesMN ::= SEQUENCE (SIZE (1..maxSimultaneousBands)) OF BandEntryIndex

***SelectedBandEntriesMN*: both the selected *bandEntry* by the MN and the forbidden band entries (for the MUSIM purpose) shall be included.**

Thus, the following proposals can be considered:

**Proposal 1: The MN can indicate the forbidden band entries (for the MUSIM purpose) info to the SN.**

**Proposal 2: As an implementation method, the existing *selectedBandEntriesMNList*****can be reused to include both the selected band entries by the MN and the forbidden band entries (for the MUSIM purpose).**

Therefore, companies are invited to provide their view on the following questions.

**Q1: Do companies agree the proposal 1?**

1. **Yes**
2. **No**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answers (Yes/No)** | **Comments** |
| Samsung | Yes |  |
| Ericsson | Yes, but | MN need to know that SN supports this signalling. Otherwise, MN probably need to release the SCG. |
| ZTE | Yes | About whether SN supports this feature, it can be implemented by OAM (maily considering that it’s a static feature, and if we use Xn interface it would also bring spec impact to the RAN3, so at this stage we tends to the OAM-based solution) |
| vivo | Yes  | Agree with ZTE |
| Huawei/HiSilicon | Yes |  |

**Summary:**

TBD

1. xxx

**Q2: Do companies agree the proposal 2?**

1. **Yes**
2. **No**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answers (Yes/No)** | **Comments** |
| Xiaomi | Yes | Maybe we should only use Proposal 2. It is unclear why the SN needs to know the prohibited band is due to MUSIM purpose or other purposes. |
| Samsung | See comments | Another way is that MN sends received UAI to the SN. Existing IE ***ueAssistanceInformationSourceSCG*** *could be reused.* |
| Ericsson | Maybe | This would solve or reduce the need for MN to know that SN supports the feature. Also the Samsung proposal seems ok, but, as commented, probably need MN awareness that SN support the signalling. |
| ZTE | Yes | About whether SN supports this feature, it can be implemented by OAM.For the forbidden band combination, samsung’s proposal seems also OK, but If the MN make the final decision based on the UAI and forward to the SN, the SN sides workload can be reduced.We are also open to see other companies’ view.   |
| vivo | Yes | It is fine to consider reusing *ueAssistanceInformationSourceSCG*. But, as with *ueAssistanceInformationSourceSCG* Includes for each UE assistance feature associated with the SCG, the information last reported by the UE in the NR *UEAssistanceInformation* message for the source SCG, if any.We wonder whether UE would report two UE assistance information one for MN and one for SN, or one MN can make the right decision ?  |
| Nokia | Yes | I think we intend to select one of the option. We prefer this option which does not introduce additional RAN3 information element. The MUSIM UAI is not cell-group specific , so how this can be reused is not clear. And it is upto MN to decide on which bands to be used at SN. So it can decide to send selected forbidden-carriers also instead of all. Hence proposal 2 is preferred |
| Huawei/HiSilicon | See comments | Agree with Samsung, there is another way beside the solution of proposal 2. Further discussion on the detailed solution to implement the proposal 1 is needed. |

**Summary:**

TBD

Furthermore, to indicate the affected bands with restricted capabilities, the MN can also indicate to SN about the capability restriction info, if the corresponding band is allowed for the SN. As Rapporteur point of view, more illustration can be considered on the affected capability coordination as follows:

Taking the below Figure as an example, if the band entry 3 was affected (e.g., the maximum MIMO layer was restricted to 2 but in the original featureset it can support 4 or 8) by the MUSIM operation, the MN also needs to indicate the band entry 3 with affected capabilities to the SN.



Based on above example, the following proposal can be considered:

**Proposal 3: For the affected bands with restricted capabilities, the MN can also indicate the SN about the capability restriction info if the corresponding band is allowed for the SN.**

**Q2: Do companies agree the proposal 3?**

1. **Yes**
2. **No**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answers (Yes/No)** | **Comments** |
| Xiaomi | Yes |  |
| Ericsson | Yes, but | As commented above, MN need to know that SN supports this, otherwise MN need to release the SCG. |
| vivo | Yes | Proponent |
| Huawei/HiSilicon | Yes |  |

**Summary:**

TBD

If **proposal 3** is agreeable, a potential ASN.1 coding to reflect MN indicating affected bands with restricted capabilities to SN may be as follows:

ConfigRestrictInfoSCG ::= SEQUENCE {

 allowedBC-ListMRDC BandCombinationInfoList OPTIONAL,

/\*omit the unchanged part\*/

 …

[[

affectedBandEntriesSNList SEQUENCE (SIZE (1..maxBandComb)) OF AffectedBandEntriesSN OPTIONAL,

AffectedBandEntriesSN ::=        SEQUENCE (SIZE (1..maxSimultaneousBands)) OF AffectedSNBandEntry OPTIONAL

]]

}

AffectedSNBandEntry ::= SEQUENCE {

bandEntryIndex BandEntryIndex

musim-capabilityRestricted-r18 FFS

}

**Q3: If proposal 3 is agreeable, do companies agree with the above ASN.1 coding as baseline for the affected capabilities coordination?**

1. **Yes**
2. **No**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answers (Yes/No)** | **Comments** |
| Xiaomi | Yes |  |
| Samsung | No | It would be simpler to forward the UAI to SN. For capabilities, MN just forwards the received UECapabilityInformation message and SN retrieves the required information from the message. Similarly UAI also can also be send in *ueAssistanceInformationSourceSCG,* and if needed field description could be updated*.*This approach will be simpler and forward compatible. There is no need to define a new mechanism. |
| Ericsson | No | Tend to agree with Samsung. But see also comments above. |
| ZTE | Yes | About the comments from Samsung, we think for a BC, there may be different restrictions: e.g. BC1: Band1+2 Band 1: MIMO layer =2 and Band 2 MIMO layer = 4 or Band 1: MIMO layer =4 and Band 2 MIMO layer = 2 The MN need to determine the MIMO layer at MN side first, then the SN side MIMO layer can be further determined.If only forward the UAI to the SN, the SN can’t make final decision without MN side’s MIMO layer configuration.Thus for the above case, only forwarding the UAI to the SN would not be enough. |
| vivo | Yes | Propotent |
| Nokia | See comments | P3 is needed if P1 was chosen. If P2 is chosen this is not needed. |
| Huawei/HiSilicon | No | Agree with Samsung.For case provided by ZTE, based on current running CR, the UE can only indicate one restricted capability, i.e. one set of MIMO layers for serving cell(s) or band entry(s), we think current reporting is enough. If there are multiple restrictions supported by UE, UE just reports a best one, it is simple for NW configuration and MN-SN coordination with peak data rate. |

**Summary:**

TBD

## Bandwidth restriction

On bandwidth restriction, RAN2#123bis meeting agreements are below:

* It is confirmed that the previous agreement that Maximum MIMO layers restriction (and bandwidth restriction, if supported) is reported per CC at least applies for the reactive approach.
* Baseline for the proactive approach: Maximum MIMO layers restriction (and bandwidth restriction, if supported) is reported *per FSPC (per cc per BC)*

As described in paper R2-2309792, in the IDC scheme, the network can configure a frequency range list to the UE, and the UE can indicate one affected frequency range overlapping with one frequency range included in the configured frequency range list, where each affected frequency range consist of a center frequency and an affected bandwidth. Band conflict can also happen in case on MUSIM. To solve the MUSIM band conflict issue, a similar approach can be applied with limited specification to support bandwidth restriction reporting, thus, the following proposal can be considered:

**Proposal 4: To solve MUSIM band conflict issue, the UE can indicate the temporary supported channel bandwidth restriction.**

**Q4: Do companies agree the proposal 3?**

1. **Yes**
2. **No**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answers (Yes/No)** | **Comments** |
| Xiaomi | Yes |  |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| ZTE | Yes |  |
| vivo | Yes |  |
| Nokia | yes |  |
| Huawei/HiSilicon | No | The motivation of reduced aggregated bandwidth introduced in overheating/power saving assistance information is power saving, the power consumption can be reduced according to the reduced bandwidth. However, from UE capability perspective, we don’t see the case that the supported bandwidth is restricted. Some companies mentioned that this is to solve band conflict issue, however, it can be addressed by release/recovery of SCells/SCG, or by UE indicating the forbidden band(s). So we think bandwidth is unnecessary for MUSIM purpose. |

**Summary:**

TBD

Currently, the UE will report its supported channel bandwidth on one carrier of a band of a band combination in *SupportedBandwidth* capability. As RAN2 has already agreed that “Baseline for the proactive approach: Maximum MIMO layers restriction (and bandwidth restriction, if supported) is reported *per FSPC (per cc per BC)*”. but based on recent agreement below:

* For Rel-18 MUSIM dual active operation, UE signals its temporary capabilities restrictions as forbidden band combinations with band indexed to the band-filter list and/or affected band combinations with band indexed to the band-filter list along with explicit fields for restricted (lower) capabilities e.g. maximum MIMO layers.

UE is allowed to signal its temporary capabilities restrictions as forbidden band combinations with band indexed to the band-filter list and/or affected band combinations with band indexed to the band-filter list along with explicit fields for restricted (lower) capabilities e.g., maximum MIMO layers. To align ASN.1 coding with maximum MIMO restriction reporting, the Rapporteur suggests aligning bandwidth restriction coding with current proactive capability restriction ASN.1 in the running CR. Thus, if **proposal 4** is agreeable, a potential ASN.1 coding to reflect UE indicating bandwidth restriction may be as follows:

MUSIM-AffectedBandCombList-r18 ::= SEQUENCE (SIZE (1..maxBandComb)) OF MUSIM-AffectedBandComb-r18

MUSIM-AffectedBandComb-r18 ::= SEQUENCE (SIZE (1.. maxSimultaneousBands)) OF MUSIM-CapabilityRestrictedBandParameters OPTIONAL

MUSIM-CapabilityRestrictedBandParameters SEQUENCE {

 bandEntryIndex INTEGER(1..maxSimultaneousBands),

MUSIM-CapabilityRestrictedBandParameters SEQUENCE {

 bandEntryIndex ::= INTEGER(1..maxSimultaneousBands),

 musim-capabilityRestricted-r18 SEQUENCE {

 musim-MIMO-Layers-DL-r18 INTEGER (1..8) OPTIONAL,

 musim-MIMO-Layers-UL-r18 INTEGER (1..4) OPTIONAL

 supportedBandwidthDL supportedBandwidth OPTIONAL,

 supportedBandwidthUL supportedBandwidth OPTIONAL

 }

}

MUSIM-CellToAffect-r18 ::= SEQUENCE {

 musim-SCellIndex-r18 SCellIndex,

 musim-MIMO-Layers-DL-r18 INTEGER (1..8) OPTIONAL,

 musim-MIMO-Layers-UL-r18 INTEGER (1..4) OPTIONAL

 supportedBandwidthDL supportedBandwidth OPTIONAL,

 supportedBandwidthUL supportedBandwidth OPTIONAL

}

**Q5: If proposal 4 is agreeable, do companies agree with the above ASN.1 coding as baseline for the temporary supported channel bandwidth restriction indication?**

1. **Yes**
2. **No**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answers (Yes/No)** | **Comments** |
| Xiaomi | Yes |  |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| ZTE | Yes |  |
| vivo | Yes |  |
| Nokia | Yes |  |

**Summary:**

TBD

## SCG/SCell release using SRB3

On whether SRB3 can be used to indicate capability restriction, there is an FFS follows:

*FFS whether UE can indicate temporary capability restrictions by explicitly indicating a SCG/SCell release via SRB3 for MUSIM purpose.*

The issue was also discussed in paper R2-2309553. It is argued that UE can use SRB3 to report SCG/SCell release. If SRB3 is used for this purpose, there would be RAN3 related work, then RAN2 would Ls to RAN3 to do the corresponding work. On the other hand, RAN2 has agreed to support MN-SN coordination signaling for UE temporary capability restriction. Without SRB3 involvement UE can still use SRB1 to indicate SCG/SCell release and the existing MN-SN coordination signaling can be reused, so no extra enhancement is needed. From Rapporteur view, using SRB3 for SCG/SCell release indication is not essential functionality for UE temporary capability restriction indication, thus Rapporteur proposes:

**Proposal 5: UE temporary capability restrictions indication of SCG/SCell release via SRB3 for MUSIM purpose is not supported in this release.**

**Q6: Do companies agree the proposal 5?**

1. **Yes**
2. **No**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answers (Yes/No)** | **Comments** |
| Xiaomi | Yes |  |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| ZTE | Yes | We agree with the proposal 5.For the reactive case, besides the SCG/SCell Release, the UE can also indicate MIMO Layer/Bandwidth restriction, for this part, we are not sure whether it shall be supported via SRB3 or not. |
| vivo | Yes |  |
| Nokia | Yes |  |
| Huawei/HiSilicon | Partly Yes | For SCG release, we agree that SCG release via SRB3 for MUSIM purpose is not supported in this release. But for SCell release, it is a bit unclear, we are not sure whether it includes SCell for MCG and SCell for SCG. Currently we don’t discuss whether the capabilities restriction reporting via UAI is per UE or per CG. For SCell release in NR-DC, further discussion is needed. |

**Summary:**

TBD

## Gap priority “keep” solution configuration

On gap priority “keep” solution, RAN2#123bis meeting agreements are below:

* Introduce single bit indication in MUSIM assistance information to indicate the UE preference of “keep” option.
* Reuse existing control flag (i.e. musim-GapPriorityAssistanceConfig-r18 in running CR) to indicate whether the UE could include “keep” option for MUSIM gap.
* FFS if any other configuration or related behaviour is needed.

It is still an open issue, after UE indicates the preference of “keep” option, whether NW should explicitly send a configuration to allow UE to use “keep” solution option. Rapporteur understands that after UE indication of preference for “keep” solution, NW should have the flexibility to allow UE to use “keep” solution option or not. Thus, Rapporteur proposes:

**Proposal 6: After UE indicates its preference for gap priority “keep” solution option, NW can configure UE to use “keep” solution option or not.**

**Q7: Do companies agree the proposal 6?**

1. **Yes**
2. **No**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answers (Yes/No)** | **Comments** |
| Xiaomi | Yes |  |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| ZTE | Yes |  |
| vivo | Yes |  |
| Nokia | Yes |  |
| Huawei/HiSilicon | Slightly prefer No | This makes the procedure complicated. For MUSIM gaps, the network mainly follows UE request if the network configures it, otherwise the network can choose to de-configure this feature. |

**Summary:**

TBD

## Other issue?

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## Additional issues for online discussion based on contribution

**Issue 1**: **Early capability restriction indication**

* Working assumption: Early capability restriction indication is provided in Msg5. Detailed UE behaviour, if any, can be further discussed.

**Issue 2**: **UAI handling for MUSIM**

Normally for the UAI, network can disregard the assistance information and configure the UE (as per TS 38.300).Is this behaviour applicable for UAI to inform temporary capability restrictions? i.e. For MUSIM temporary capability restrictions, can the network reconfigure the UE with the temporarily restricted capabilities until the restrictions are removed, after accepting restrictions? If it is allowed, can the UE consider procedure as successful and send ReconfigurationComplete to inform the network about the restrictions again through the UAI? This could be a generic question on whether it is acceptable that the UE restricts the capabilities for the short interval that the UAI is send and reconfiguration according to restricted capabilities are received.

**Issue x**: Handling of RRC Configurations that partly accept the requested UAI for reactive approach.

It was agreed that UE should stop the timer for the reactive approach when it receives configuration that does not exceed the requested capability. In some cases, to increase the capacity at NW-B UE may request to release multiple secondary-cells at NW-A. If NW-A only release one of the secondary-cell, whether UE should accept and stop the timer. OR the UE is allowed to send another UAI to request release of another secondary cell is not clear. In our view, if the provided configuration allows the UE to maintain the RRC connection with minimum functionality the UE should not attempt for another reactive UAI. This needs to be clarified.

**Issue y** : Mismatch of UE and NW configuration for reactive approach.

RAN2 agreement in last meeting says that : On timer expiry UE applies the requested configuration. But further issues related to mismatch of NW and UE configuration and any signalling required is not discussed. For example, if UE request for multiple secondary-cells to be released and NW send configuration to release only one secondary-cell and if this message is not received at UE due to radio conditions, on timer expiry UE and NW may have different configuration. To avoid this mismatch UE need to send another UAI indicating about the released resources.

Issue z: Impacts to conditional configurations pending for execution due to capability restriction (reactive approach) and other mobility procedures that make use of stored configurations.

**Issue x**: **Restricted number of CCs**

For restricted capabilities, some companies mentioned “the number of CCs” can be supported, we have some sympathy on this. The number of CCs is simpler, if the UE finds that the total number of CCs is restricted, this can be reported instead of complicated proactive BC signalling.

**Issue y**: **Wait timer configuration**

It was agreed that a wait timer for reactive UAI was introduced for reactive approach. However, it should be further discuss whether the “wait timer” should be mandatory configured by the NW if the NW configure the temporary capability restriction for the UE. There was similar discussion in Rel-17 MUSIM, the relevant wait timer is mandatory if UE release request function is configured.

# Conclusion

In this paper, the following proposal are given:

1. Xxx