**3GPP TSG-RAN WG2 Meeting #110e R2-200xxxx**

**Online, 1st – 12th June 2020**

**Agenda item: 6.11.3**

**Source: MediaTek Inc,**

**Title: [AT110-e][504][PowSav] CP Open and ASN.1 Issues (Mediatek)**

**Document for: Discussion and decision**

# 1 For further discussion (including documents submitted to section 6.11.3)

## O803: Do we need to clarify that max MIMO layer preference applies to each BWP that the UE operates on?

| **Company** | **Yes/No** | **Comments** |
| --- | --- | --- |
| ERI | Yes | We think that the current wording “*the UE prefers to reduce the number of maximum MIMO layers of each serving cell*” is clear that the UE prefers a max MIMO for each BWP the UE operates on. But it is not clear if this is achieved via RRC reconfiguration (the maxMIMO on all BWPs is reconfigured below the preferred max) or BWP switching (e.g. UE is switched to a BWP with maxMIMO below the preferred maxMIMO). We think the latter aspect could be clarified by “*the UE prefers to reduce the number of maximum MIMO layers of each BWP, if configured, of each serving cell*”. |
| Huawei | Yes |  |
| CATT | No | We don’t see a need to have a different wording than the overheating wording. Our understanding is that this preference is “for each serving cell” and therefore acts at the same level as the per-cell configured DL Max MIMO layer value (*maxMIMO-Layers* in *PDSCH-ServingCellConfig*). And regarding the DL MIMO layer RRC configuration, it was agreed that the configured per-BWP DL max MIMO layer value (*maxMIMO-Layers-r16* in *PDSCH-Config*) is expected to be less than or equal to the per-cell configured DL Max MIMO layer value (if configured). Thus, it is clear enough max MIMO layer preference applies to each serving cell. It is then left to network implementation how to configure maximum number of DL MIMO layers per BWP, after receving the max MIMO layer preference of each serving cell. *See also the new issue on the interpretation of the “the current active configuration” for such UAI that we added at the bottom of this document*. |
| vivo |  | We think the preferred reduced maximum number of MIMO layers of each serving cell should be applied to all BWPs that UE operates on. (Any other understanding?) From the network side, either reconfiguring maxMIMO layer for all BWPs below the preferred maximum number, or switching to a BWP with maxMIMO layer lower than the preferred maximum number, should be supported. It is up to network to implement. Thus, from our side, there is no difference to clarify this explicitly or not. |
| MediaTek |  | Agree with vivo that the preference should be applied to all BWPs that the UE operates on. How this is achieved (RRC reconfiguration vs BWP switch) is for NW implementation. |
| Intel | Yes | We share the understanding explained by vivo and MediaTek. In addition, we are OK with Ericsson’s intention although prefer avoiding the three “of” statements, e.g. “*the UE prefers to reduce the number of maximum MIMO layers* ***in each configured BWP*** *of each serving cell*” |
| Xiaomi | Yes | Agree with CATT that the max MIMO layer preference from UE reporting is per-cell while the RRC configuration to the UE can be per-cell or per-BWP. |
| OPPO |  | We think the intention for a UE to report a prefered maximum number of MIMO layer is the UE prefers a maximum number of MIMO layer for the activated DL BWP for each serving cell. From UE’s point of view, it does not need to report a preference on maximum number of MIMO layer for the DL BWP which the UE does not work on.  So we think we need to clarify that max MIMO layer preference applies to the activated BWP of each serving cell that the UE operates on. |
| Apple | Yes | Our understading is that the UE preference for the maximum numberof MIMO layers should be applicable for all the BWPs that the UE is operating on. |
| Qualcomm | Yes | We share the same understanding with companies above, i.e. this maximum number of MIMO layer indicated by UE is a upper limit that applies to all DL BWPs of the UE, and then network can configure actual number of MIMO layers smaller or equal to that limit in each individual BWP. |
| Samsung | Yes | We also share same understanding with CATT, Apple, QC and so on.  And, we would like to keep the current field description, which is sufficient to understand. |
| ZTE |  | We prefer to keep the current field description. |
| LG | No | We think it is sufficient that max MIMO layer preference applies to each serving cell. It is a network implementation how to configure max MIMO layer based on the received preference, e.g., reconfiguring max MIMO layer per BWP or per serving cell, or indicating BWP switching. |

***Rapporteur’s summary:***

There seems to be some support to clarify that max MIMO layer preference applies to each BWP that the UE operates on. Accordingly, the following is proposed.

**Proposal 1 (O803): Clarify that max MIMO layer preference applies to each BWP of each cell that the UE operates on.**

## V210/R2-2004643: This paper discusses the note on the implicit SCG release indication of indicating max CC = 0 or max BW = 0.

This paper suggests that the if zero value of maxCC (or max BW) should override a previous signalled non-zero value of max BW (or max CC), to avoid any misinterpretations in case a zero value is provided for one parameter and a non-zero value for the other parameter. During the discussion, it was pointed out that the problem can be avoided by changing the note to say that max CC *and* max BW should be set to 0 to indicate an implicit SCG release. The rapporteur suggests a change as below to address the problem:

NOTE 3: The UE can implicitly indicate a preference for NR SCG release by reporting the maximum aggregated bandwidth preference for power saving of the cell group, if configured, as zero for both FR1 and FR2, and by reporting the maximum number of secondary component carriers for power saving of the cell group, if configured, as zero for both uplink and downlink.

Companies are asked to provide their view on the suggested clarification

| **Company** | **Clarification needed (yes/no)** | **Agree with suggested change (yes/no)** | **Comments** |
| --- | --- | --- | --- |
| ERI | Yes | Yes |  |
| Huawei | Yes | Yes |  |
| CATT | Yes | Yes |  |
| vivo | Yes | Yes | From our side, we would like to confirm that companies have same understanding on the UE behavior to indicate the preferred SCG release.  The above suggestion is OK for us, or we can consider the the note suggested in our contribution. |
| MediaTek | Yes | Yes |  |
| Intel | Yes | Yes |  |
| Xiaomi | Yes | Yes |  |
| OPPO | No |  | According to aggreement in RAN2#109e, UE can implicitly indicate a preference for NR SCG release by indicating zero number of carriers **or** zero aggregated maximum bandwidth in both FR1 and FR2. So in our opinion, if a UE wants to indicate a preference for NR SCG release, it could either report zero number of carriers in both FR1 and FR2 or report zero aggregated maximum BW in both FR1 and FR2, and it does not need to report zero values for both carrier number and aggregated maximum BW.  We see no need to clarify for this. |
| Apple | Yes | Yes |  |
| Qualcomm | Yes | yes |  |
| Samsung | Yes | Yes |  |
| ZTE | Yes | Yes |  |
| LG | Yes | Yes |  |

***Rapporteur’s summary:***

12 out of 13 companies indicate that they support the text proposal. The following is therefore proposed

**Proposal 2 (V210): The UE can implicitly indicate a preference for NR SCG release by reporting the maximum aggregated bandwidth preference (if configured) and maximum number of secondary component carriers (if configured) as zero.**

## R2-2004558: On the impact of secondary DRX group on DRX preference UAI – **moved to email discussion 37**

This paper discusses the interpretation of the preferred DRX inactivity timer when two DRX groups are configured for a cell group. The following options are outlined in the document:

* *Option 1：The DRX-Preference is applied to primary DRX group by default even if secondary DRX group is configured, i.e., no DRX preference for secondary DRX.*
* *Option 2: When the UE provides its preference on DRX parameters, the UE explicitly indicates whether this reported DRX-Preference is corresponding to the secondary DRX group or not.*
* *Option 3: It’s up to network configuration whether DRX-Preference is for secondary DRX or not if secondary DRX group is configured.*
* *Option 4: Secondary DRX group specific DRX-Preference for power saving can be configured by the network, UE can report DRX-Preference for both primary DRX and secondary DRX.*

Companies are asked to provide their views on the issue raised in this document.

| **Company** | **Preferred option** | **Comments** |
| --- | --- | --- |
| Huawei |  | We are ok to discuss it under the email discussion on secondary DRX (#037) |
| CATT |  | Also fine to discuss it as part of email discussion [037] |
| vivo |  | We are also fine to discuss this issue in TEI on secondary DRX group. |
| MediaTek |  | Moved to email discussion 37 |
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## R2-2005145: On a new UAI parameter for time gap between WUS and onDuration

This paper suggests that a new UAI is needed to indicate the UE preference on the time gap between DCI2\_6 and DRX on duration. It points out that there is UE capability signalling in place for this time gap, but a UE assistance can bring additional benefits., and therefore proposes:

*The UE may signal UE assistance information including a preferred value of Minimum Time Gap in addition to signaling its Minimum Time Gap capability.*

Companies are asked to provide their views on this proposal.

| **Company** | **Support (yes/no)** | **Comments** |
| --- | --- | --- |
| ERI | No | This topioc has been discussed in RAN1, and any preference signalling should be discussed there.  Furthermore the UE indicates a minimum time gap that the UE supports via UE capability. Thus the UE already has the possibility to omit some time gaps that it does not prefer via UE capability. |
| Huawei | No | The benefit (power saving gain?) can be introduced is not clear, the gap capability is sufficient. |
| CATT | No | We see no strong motivation to introduce a new preference for power saving at this later stage, given a capability is already supported and seems sufficient for us. |
| vivo | No | We also think this should be discussed in RAN1 first.  In RAN1, they agreed this time gap is the UE capability. We are not sure about the benefit to report the UE preference, which should be first approved in RAN1, as the time gap may impact the signaling design for DCP. |
| MediaTek | No | We see no strong motivation for this. UE capability reporting is sufficient to achieve the necessary power savings |
| Intel | - | We share the view as Ericsson that this topic should be driven, if needed, by RAN1 (which was also indicated on UE capability email discussion) |
| Xiaomi |  | Since RAN1 is discussing this, we can wait RAN1’s reply. |
| OPPO | No | We think signaling UE’s capability of Minimum Time Gap is sufficient. No need to introduce UE’s preferred value of Minimum Time Gap in UE assistance information. |
| Apple | No | This is in our view is a RAN1 topic. |
| Qualcomm | No | Minimum time gap being a UE capability is sufficient, because it is mostly determined by UE’s hardware capability. Hence it is relatively static and does not need to dynamically adjusted through UAI. |
| Samsung | No |  |
| ZTE | No | As agreed in RAN1, The minimum time gap between the end of the slot of last DCI format 3\_0 monitoring occasion and the start of the DRX ON is a UE capability based on subcarrier spacing.  UE report the minimum time gap via UE capability report rather than UE assistance information. The detailed ASN.1 should be discussed and decided together with other RAN1 capabilities. |
| LG | No | We also think this is RAN2 scope. |

***Rapporteur’s summary:***

There is no support for the proposal on UAI minimum time gaps. No proposal is made.

## O804: Optionality of the maxCC-Preferences for UL and DL

For overheating the UL and DL preferences are mandatory present in all the overheating IEs. This is also the case for power saving, except for the maxCC-Preferences IE:

**OverheatingAssistance** ::= SEQUENCE {

reducedMaxCCs SEQUENCE {

reducedCCsDL INTEGER (0..31),

reducedCCsUL INTEGER (0..31)

} OPTIONAL,

reducedMaxBW-FR1 SEQUENCE {

reducedBW-FR1-DL ReducedAggregatedBandwid,

reducedBW-FR1-UL ReducedAggregatedBandwid

} OPTIONAL,

reducedMaxBW-FR2 SEQUENCE {

reducedBW-FR2-DL ReducedAggregatedBandwh,

reducedBW-FR2-UL ReducedAggregatedBandwih

} OPTIONAL,

reducedMaxMIMO-LayersFR1 SEQUENCE {

reducedMIMO-LayersFR1-DL MIMO-LayersDL,

reducedMIMO-LayersFR1-UL MIMO-LayersUL

} OPTIONAL,

reducedMaxMIMO-LayersFR2 SEQUENCE {

reducedMIMO-LayersFR2-DL MIMO-LayersDL,

reducedMIMO-LayersFR2-UL MIMO-LayersUL

} OPTIONAL

}

**Power Saving:**

MaxBW-Preference-r16 ::= SEQUENCE {

reducedMaxBW-FR1-r16 SEQUENCE {

reducedBW-FR1-DL-r16 ReducedAggregatedBandw,

reducedBW-FR1-UL-r16 ReducedAggregatedBand

} OPTIONAL,

reducedMaxBW-FR2-r16 SEQUENCE {

reducedBW-FR2-DL-r16 ReducedAggregatedBandw,

reducedBW-FR2-UL-r16 ReducedAggregatedBandw

} OPTIONAL

}

MaxCC-Preference-r16 ::= SEQUENCE {

reducedCCsDL-r16 INTEGER (0..31) OPTIONAL,

reducedCCsUL-r16 INTEGER (0..31) OPTIONAL

}

MaxMIMO-LayerPreference-r16 ::= SEQUENCE {

reducedMaxMIMO-LayersFR1-r16 SEQUENCE {

reducedMIMO-LayersFR1-DL-r16 INTEGER (1..8),

reducedMIMO-LayersFR1-UL-r16 INTEGER (1..4)

} OPTIONAL,

reducedMaxMIMO-LayersFR2-r16 SEQUENCE {

reducedMIMO-LayersFR2-DL-r16 INTEGER (1..8),

reducedMIMO-LayersFR2-UL-r16 INTEGER (1..4)

} OPTIONAL

}

It is proposed to align with the overheating IEs:

MaxCC-Preference-r16 ::=  SEQUENCE {

    reducedCCs             SEQUENCE {

       reducedCCsDL-r16      INTEGER (0..31),

        reducedCCsUL-r16      INTEGER (0..31)

    }

} OPTIONAL

What do companies prefer?:

1. Keep MaxCC IE as is
2. Change MaxCC IE such that UL and DL are mandatory present, similar as all the other IEs for power saving and overheating

| **Company** | **Preferred option** | **Comments** |
| --- | --- | --- |
| ERI | 2 | Alignment with overheating has been used as an argument to decide on the power saving structures. We can follow the same principle here. |
| Huawei | 1 or 2 | We don’t have a strong view, either way works. As we decide to use delta-signalling reporting, it should be supported that UE includes MaxCC-Preference-r16 with all the sub-fields absent. |
| CATT | 1 | The IE *MaxCC-Preference-*r16 itself is already optional in the parent IE *UEAssistanceInformation-v16xy*. So, as we understand it, the proposal reduces to removing the optionality of the fields *reducedCCsDL-r16* and *reducedCCsUL-r16*. But we agree with the rapporteur that this would contradict last meeting’s agreement on ‘no preference’ of feature parameters. Thus we prefer to stick to the current specification CR. |
| vivo | 1 | We prefer to keep the current maxCCs as optional. In this way, we can report an empty IE to indicate ‘no preference’. |
| MediaTek | 1 or 2 (with changes) | For option 2 to be compatible with our earlier agreements to allow ‘no preference’ signaling, *reducedCCs* field must be OPTIONAL. With this change to option 2, we are ok with both design choices. |
| Intel | - | We agree that it is preferable to aligned the operation by making them all optional (as suggested in O804) or by removing the optionality of MaxCC IE (as suggested by option 2). We would be ok either way. |
| Xiaomi | 2 | Simply to follow overheating. |
| OPPO | 2 (with change proposed by MediaTek) | To MediaTek: Based on our understanding, the intention is to define reducedCCs as “OPTIONAL” as below?  MaxCC-Preference-r16 ::=  SEQUENCE {      reducedCCs             SEQUENCE {         reducedCCsDL-r16      INTEGER (0..31),          reducedCCsUL-r16      INTEGER (0..31)      } OPTIONAL  } |
| Apple | 2 | Prefer option 2 as it aligns with overheating. |
| Qualcomm | 2 | We prefer option 2 so that it aligns with overheating IE. |
| Samsung | 2 | Prefer to align it with overheating IE. If agreeable, we would like to update slightly current ASN.1 structure for further consistency (see S407, S408). |
| ZTE | 2 | To align with overheating. |
| LG | 1 | With option 2, the UE cannot report report an empty IE to indicate ‘no preference’. This contradicts the last meeting agreement on 'no preference' of feature parameter. |

***Rapporteur’s summary:***

10 companies prefer option 2 while 6 companies prefer option 1 (companies that indicate support for both are counted twice). Since this is a minor signalling aspect with no behavioural change, option 2 is proposed along with the merge with S407 that was agreed at the previous meeting.

**Proposal 3 (S407): Align maxCC reporting structure for power saving with overheating**

## Other documents

Documents R2-2005405 and R2-2004860 are not listed here as they are addressed in section 2. Document R2-2004758 is not discussed here as it was discussed at the last meeting.

| **Company** | **Preferred option** | **Comments** |
| --- | --- | --- |
| Apple |  | Regarding R2-2004758, our understading was that as per section 6.11.3 of R2-2003804 (Session Chair Notes from RAN2#109bis-e), the idea of configuratbility was discussed but no agreement captured (copy pasted below for reference).  ***Discussions***  *Proposal 1: UE can indicate any preferred value within its capability for maximum aggregated bandwidth, number of carriers, MIMO layers and minimum scheduling offset.*  - Apple suggests that we can limit the amount of times that the UE requests. Mediatek explains that in the email discussion there was very limited supported.  - Qualcomm wonders if we can make this network configurable. ZTE, Nokia, and Ericsson don’t think we should make everything configurable. Apple agrees with the compromise. Ericsson thinks that the UE can just send a no preference indication and the network can configure the UE accordingly.  - Vivo asks how the network would configure it, it would need to report UE capability.  - Huawei supports and is ok to have the configurability. |
| Qualcomm |  | We support Apple’s proposal of continuing this discussion. |
| Samsung |  | Share with Apple and QC’s view. We prefer to signal it within capability. |
| LG |  | We prefer to incate any value within capability for UE flexibility. |

***Rapporteur’s summary:***

Please note the following guidance from the chair:

‘*Proposals to reverse agreements will be downprioritised and are discouraged unless there is significant support. Summary discussion rapporteurs should ONLY include those proposals for agreement reversal if they feel there is a number of companies supporting the proposal, otherwise, they should not be included in the summary papers.*’

Based on this guidance and given that this topic was discussed extensively at the previous meeting, I do not think this topic can be included again in this discussion.

## New (late) issue on the meaning of the “current active configuration” for the reduced MIMO layer UAI [CATT]

In our view it is unclear how to interpret the “current active configuration” for the fields *reducedMIMO-LayersFR1-DL, reducedMIMO-LayersFR1-UL, reducedMIMO-LayersFR2-DL, reducedMIMO-LayersFR2-UL*.

Taking, for example, the field *reducedMIMO-LayersFR1-DL*:

|  |
| --- |
| ***reducedMIMO-LayersFR1-DL***  Indicates the UE's preference on reduced configuration corresponding to the maximum number of downlink MIMO layers of each serving cell operating on FR1 indicated by the field, to address overheating or power saving. This field is allowed to be reported only when UE is configured with serving cells operating on FR1. The maximum number of downlink MIMO layers can only range up to the current active configuration when indicated to address power savings. |

What is “the current active configuration”? There could be several interpretations:

Option 1.       The min (or max?) across all active BWPs in FR1 of all MIMO rank indications in DCIs of last scheduled PDSCH at the time the UAI is triggered;

Option 2.       The minimum value of all the *maxMIMO-Layers-r16* in *PDSCH-Config*, across all active DL BWP in FR1. As a recall, *maxMIMO-Layers-r16* is defined as:

|  |
| --- |
| ***maxMIMO-Layers***  Indicates the maximum MIMO layer configuration for a DL BWP. If present, this value overrides the *maxMIMO-Layers* configuration in IE *PDSCH-ServingCellConfig* when the UE operates in this BWP. If absent, the UE uses the *maxMIMO-Layers* configuration in IE *PDSCH-ServingCellConfig* when the UE operates in this BWP. The value of *maxMIMO-Layers* for a DL BWP shall be smaller than or equal to the value of *maxMIMO-Layers* configured in IE *PDSCH-ServingCellConfig* (if present). |

Option 3.       The minimum value of all the *maxMIMO-Layers* in *PDSCH-ServingCellConfig*, across all active cells in FR1. As a recall, *maxMIMO-Layers* is defined as:

|  |
| --- |
| ***maxMIMO-Layers***  Indicates the maximum number of MIMO layers to be used for PDSCH in all BWPs of this serving cell. (see TS 38.212 [17], clause 5.4.2.1). |

Option 4.       Other?

In our view:

1) is impractical because DL scheduling is definitely at a much faster rate compared with RRC signaling.

2) could only apply to DL as it does not exist for UL

3) could make sense as it also exists for UL in *PUSCH-ServingCellConfig*.

In any case we think this might need to be clarified.

Which of the above options should be use for interpretting “the current active configuration” in the field descriptions of *reducedMIMO-LayersFR1-DL, reducedMIMO-LayersFR1-UL, reducedMIMO-LayersFR2-DL, reducedMIMO-LayersFR2-UL*?

| **Company** | **Preferred option** | **Comments** |
| --- | --- | --- |
| CATT | Option 3 | Because the *maxMIMO-Layers* parameter at serving cell level exists for both DL (in *PDSCH-ServingCellConfig*) and in UL (in *PDSCH-ServingCellConfig*), and acts as an upper bound for all BWPs of the serving cell. |
| Qualcomm | Option 4 | In our understanding, for a given serving cell, the current ”upper limit” on the number of MIMO layers should be the MAXIMUM of all the maxMIMO-Layers across all BWPs of this serving cell. |
| Samsung | Option 4 | Same understanding with QC. MAXIMUM seems further reasonable. |
| Apple | Option 4 | Agree with Qualcomm and Samsung. The current configuration should refer to the maximum value of the number of MIMO layers that is configured across all BWPs of the current serving cell. |
| LG | Option 4 | We have same understanding with Qualcomm. But, this text can be modified if RAN2 agrees to go "within UE capability". |
| MediaTek | Option 3 | In our understanding, option 4 proposed by QC is equivalent to option 3 due to this explanation in the field description:  ‘The value of *maxMIMO-Layers* for a DL BWP shall be smaller than or equal to the value of *maxMIMO-Layers* configured in IE *PDSCH-ServingCellConfig*’ |
|  |  |  |

***Rapporteur’s summary:***

This topic was raised late and companies haven’t had enough time to respond to this question. It is suggested that this is discussed online.

**Proposal 4: Reporting of ‘up to current active configuration’ for max MIMO layers refers to the maximum number of layers configured for the cell (i.e. not just the active BWP).**

# 2 Summary of proposals

Potential easy agreements:

**Proposal 1 (O803): Clarify that max MIMO layer preference applies to each BWP of each cell that the UE operates on.**

**Proposal 2 (V210): The UE can implicitly indicate a preference for NR SCG release by reporting the maximum aggregated bandwidth preference (if configured) and maximum number of secondary component carriers (if configured) as zero.**

**Proposal 3 (S407): Align maxCC reporting structure for power saving with overheating**

For discussion online:

**Proposal 4: Reporting of ‘up to current active configuration’ for max MIMO layers refers to the maximum number of layers configured for the cell (i.e. not just the active BWP).**