**3GPP TSG RAN WG1 #101 R1-2004820**

**e-Meeting, May 25th – June 5th, 2020**

**Source: Moderator (NTT DOCOMO, INC.)**

**Title:** **Summary on [101-e-NR-UEFeatures-URLLCIIoT-02]**

**Agenda Item:** **7.2.11.5**

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

1. Introduction

This contribution summarizes the following email discussion/approval regarding UE features for URLLC/IIoT.

[101-e-NR-UEFeatures-URLLCIIoT-02] Email discussion/approval on capability signaling design for existing FGs for URLLC/IIoT (25th May – 2nd June) – (DCM, Hiroki)

* Discuss and decide capability signaling design (including components, candidate values, reporting type, xDD/FRx differentiations) for existing FGs
* Discuss and decide any other necessary update for the UE features list for URLLC/IIoT based on identified issues/proposals in R1-2004406
1. Discussion on UE features for URLLC

## 2.1 FG11-1/1a

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| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****( 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-1 | Monitoring DCI format 1\_2 and DCI format 0\_2 | 1. Supports monitoring DCI format 1\_2 for DL scheduling
2. Supports monitoring DCI format 0\_2 for UL scheduling
 |  | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  |  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-1a | Monitoring both DCI format 0\_1/1\_1 and DCI format 0\_2/1\_2 in the same search space  | 1. Supports monitoring both DCI format 0\_1/1\_1 and DCI format 0\_2/1\_2 in the same search space
 | 11-1 | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] |  | Optional with capability signalling |

* **Reporting type of FG11-1/1a**
	+ **Per UE: [5], [9], [10], [13], [15], [17]**
	+ **Per Band: [16]**
* **xDD/FRx diffentiation for FG11-1/1a**
	+ **No differentiation is needed: [5], [9], [10], [13], [15], [16], [17]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [5] | * FG 11-1/1a,
	+ Per UE
	+ No FR1/FR2 differentiation
	+ No TDD/FDD differentiation
 |
| [9] | * FG 11-1/1a
	+ Per-UE
	+ No xDD/FRx differentiation needed
 |
| [10] | Remove all brackets, that is, Per-UE, No TDD/FDD or FR1/FR2 differentiation |
| [13] | * FG 11-1/1a
	+ We don’t see the necessity to do differentiation for FDD/TDD and FR1/FR2. The capability on this FG 11-1/11-1a can be reported in the granularity of per UE. The above is our preferred FG 11-1 and FG 11-1a.
 |
| [15] | * FG 11-1/1a
	+ The capability on this FG 11-1 should be reported in the granularity of per UE
 |
| [16] | * FG 11-1/1a
	+ Type of capability signaling is per Band
	+ No TDD/FDD or FR1/FR2 differentiation is needed.
 |
| [17] | * FG 11-1/1a
	+ per UE, no xDD/FRy differentiation
 |

Based on above, following FL proposals are made.

### **FL proposal 1:**

* **Type of FG11-1/1a is “Per UE”**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. NR\_L1enh\_URLLC | 11-1 | Monitoring DCI format 1\_2 and DCI format 0\_2 | 1. Supports monitoring DCI format 1\_2 for DL scheduling
2. Supports monitoring DCI format 0\_2 for UL scheduling
 |  | Yes | N/A |  | Per UE | No | No | N/A  |  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-1a | Monitoring both DCI format 0\_1/1\_1 and DCI format 0\_2/1\_2 in the same search space  | 1. Supports monitoring both DCI format 0\_1/1\_1 and DCI format 0\_2/1\_2 in the same search space
 | 11-1 | Yes | N/A |  | Per UE | No | No | N/A |  | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon  | Support |
| Qualcomm | Type of signaling for both 11-1 and 11-1a should be changed to per band; in that case, no differentitation is needed.  |
| Intel | Support FL proposal 1. |
| Nokia, NSB | Support FL proposal |
| Moderator (NTT DOCOMO) | For both 11-1 and 11-1a, following is the situation. Per UE without xDD/FRx differentiation: Huawei/HiSilicon, Intel, Nokia/NSB Per band: QualcommMy suggestion is to agree on current FL proposal 1. Or can per UE with e.g., FR1/FR2 differentiation be possible compromise? |
| Apple | Support |
| Moderator (NTT DOCOMO) | Majority supports FL proposal and suggest to agree on it. |
| Qualcomm2 | No need to support the new DCIs in all the bands, We still propose to change the type to per band. |
| ZTE | Support the FL proposal  |
| Moderator (NTT DOCOMO) | There is clear majority support on “Per UE without xDD/FRx differentiation”. I suggest to agree on it. Or can we have FR1/FR2 differentiation as compromise? |
| Nokia, NSB | We support the FL proposal. We don’t see how FR1/FR2 differentiation would help here. |

## 2.2 FG11-2

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| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-2 | Rel-16 PDCCH monitoring capability  | 1. Supported combination(s) of (X, Y, μ). For each reported combination, the UE supports the limit C on the maximum number of non-overlapped CCEs for channel estimation per PDCCH monitoring span and the limit M on the maximum number of monitored PDCCH candidates per PDCCH monitoring span
2. [If UE reports the support of more than one combination of (X, Y) for a given SCS, and if multiple combinations of (X, Y) are valid for the span pattern, the combination (X, Y) with the maximum value of C and M from the valid combinations is applied]
3. Capability on the number of CCs for monitoring a maximum number of BDs and non-overlapped CCEs per span when configured with DL CA with Rel-16 PDCCH monitoring capabi6lity on all the serving cells.
 | 3-5b (TBD) | Yes | N/A |  | [FSPC]FFS: Compoent 3) reported per UE | [N/A] | [N/A] | [N/A] | This capability is signaled for SCS 15 kHz and 30 kHz. For μ=0 and 1, candidate value set for (X, Y, μ): {(7, 3, μ), (4, 3, μ), (2, 2, μ)}For component 1, a list of separate UE capabilities (X, Y, μ)for processing capability #1;For component 1, a list of separate UE capabilities (X, Y, μ)for processing capability #2;For component 3, if UE supports carrier aggregation with more than 2 DL carriers with Rel-16 PDCCH monitoring capability on all the carriers, UE should report this capability.Candidate value for component 3: {2, 3, …, 16} | Optional with capability signalling |

* **Components of FG11-2**
	+ **Necessity of Component 2**
		- **Component 2 is kept: [7]**
		- **Component 2 is removed: [4], [8], [10], [11]**
	+ **Clarify whether or not add a new component for the support of non-aligned PDCCH spans for CA: [8]**
* **Reporting type of FG11-2**
	+ **Per FSPC for component 1 and 2, per UE for component 3: [10]**
	+ **Per FS for component 1 and 2, per UE for component 3: [4], [13], [17]**
	+ **Per FS for component 1 and 2, per BC for component 3: [13], [16]**
	+ **Per UE: [15]**
	+ **Per FS: [9]**
	+ **Per FSPC: [5]**
* **xDD/FRx diffentiation for FG11-2**
	+ **No differentiation is needed: [8], [9], [16]**
* **Prerequisite feature groups for FG11-2**
	+ **3-5b is kept: [4], [13]**
	+ **3-5b is removed: [8], [14], [15], [16]**
* **Note for FG11-2**
	+ **Remove notes regarding separate UE capability reportings on C(X,Y,μ)/m(X,Y,μ) for different processing capability: [7]**
	+ **Modify the note to clarify that the minimum number of Rel-16 carriers is different for different cases, i.e. Rel-16 only or Rel-15/Rel-16 mixed scenarios: [7]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

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| [4] | In Rel-15, the PDCCH monitoring capability for Case 2 with a span gap (FG 3-5b, *pdcch-MonitoringAnyOccasionsWithSpanGap*) is reported per feature set (FS), and the capability on the number of CCs with Rel-15 PDCCH monitoring capability on all the serving cells (FG 6-5a, *pdcch-BlindDetectionCA*) is reported per UE. The same UE capability reporting type can be applied here, i.e., FG 11-2 is reported per FS and component 5) is reported per UE. As for other open points, our view is given below.* Remove component 3) since it has clearly specified in the spec.
* Prerequisite feature groups is set to 3-5b.

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| ***Suggested revision #1 on FG 11-2*** |
| Index | Feature group | Components | Prerequisite feature groups | Type(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC) |
| 11-2 | Rel-16 PDCCH monitoring capability  | 1. Supported combination(s) of (X, Y, μ). For each reported combination, the UE supports the limit C on the maximum number of non-overlapped CCEs for channel estimation per PDCCH monitoring span and the limit M on the maximum number of monitored PDCCH candidates per PDCCH monitoring span
2. ~~[If UE reports the support of more than one combination of (X, Y) for a given SCS, and if multiple combinations of (X, Y) are valid for the span pattern, the combination (X, Y) with the maximum value of C and M from the valid combinations is applied]~~
3. Capability on the number of CCs for monitoring a maximum number of BDs and non-overlapped CCEs per span when configured with DL CA with Rel-16 PDCCH monitoring capability on all the serving cells.
 | 3-5b ~~(TBD)~~ | ~~[FSPC]~~ FS~~FFS:~~ Component 3) reported per UE |

 |
| [5] | * Per FSPC
 |
| [7] | * There is no reason to define separate UE capability C(X,Y,μ)/m(X,Y,μ) for different processing capability. It should be noted that we don’t differentiate the UE capability when we define the per slot limit on the maximum number of non-overlapped CCE and PDCCH candidate.
* The square bracket for component 2 should be removed as it addresses the rule for how to determine the maximum number of M/C if more than one (X,Y, μ) is configured.
* It should also be noted that the minimum number of Rel-16 carriers is different for different cases, i.e. Rel-16 only or Rel-15/Rel-16 mixed scenarios. It should also be reflected in the second last column.

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| 11-2 | Rel-16 PDCCH monitoring capability  | 1. Supported combination(s) of (X, Y, μ). For each reported combination, the UE supports the limit C on the maximum number of non-overlapped CCEs for channel estimation per PDCCH monitoring span and the limit M on the maximum number of monitored PDCCH candidates per PDCCH monitoring span
2. ~~[~~If UE reports the support of more than one combination of (X, Y) for a given SCS, and if multiple combinations of (X, Y) are valid for the span pattern, the combination (X, Y) with the maximum value of C and M from the valid combinations is applied~~]~~
3. Capability on the number of CCs for monitoring a maximum number of BDs and non-overlapped CCEs per span when configured with DL CA with Rel-16 PDCCH monitoring capability on all the serving cells.
 | 3-5b (TBD) | Yes | N/A |  | [FSPC]FFS: Compoent 3) reported per UE | [N/A] | [N/A] | [N/A] | This capability is signalled for SCS 15 kHz and 30 kHz. For μ=0 and 1, candidate value set for (X, Y, μ): {(7, 3, μ), (4, 3, μ), (2, 2, μ)}~~For component 1, a list of separate UE capabilities (X, Y, μ)for processing capability #1;~~~~For component 1, a list of separate UE capabilities (X, Y, μ)for processing capability #2;~~For component 3, if UE supports carrier aggregation with more than 1 or 2 DL carriers with Rel-16 PDCCH monitoring capability on all the carriers, UE should report this capability.Candidate value for component 3: {2, 3, …, 16} if Rel-16 monitoring capability only on all the serving cells;{ 1,2, 3, …, 15} if Rel-15 monitoring capability and Rel-16 monitoring capability on different serving cells; | Optional with capability signalling |

 |
| [8] | * Component 2 about the multiple valid spans could be removed as it is already captured in the specs.
* Remove 3-5b as prerequisite FG
* Keep the TDD/FDD and FR1/FR2 differentiation.
* Add a new component for the support of non-aligned PDCCH spans for CA.
 |
| [9] | * FSPC not necessary; FS is sufficient
* No xDD/FRx differentiation needed
 |
| [10] | * Component 1~2 of 11-2 is FSPC. Component 3 is per-UE. A UE declaring support of rel-16 monitoring on certain CC also supports rel-15 monitoring on that CC (not simultaneously with rel-16 monitoring) based on the existing rel-15 signalling.BD limit for case 3 should be added back as a separate signalling. Not providing this does not imply a UE does not support case 3.
	+ Component 1~2 of 11-2 should be FSPC, and support of case 1 (rel-15 only)/2 (rel-16 only)/3 (mixed rel-15/16) is naturally declared by this. In other words, support of FSPC for component 1~2 does not mean that a UE only supports rel-16 monitoring in the whole BC, and it just means a UE supports rel-16 monitoring in the specific CC. There should not be additional signalling for declaring support of case 1/2/3.
	+ One case to discuss is when a UE declared support of rel-16 for all CC’s in certain BC, i.e., case 2. In this case, it is not clear if a UE also supports case 3 (or 1) if network configures rel-15 monitoring behaviour in some (or all) CC’s. In our view, this should be the interpretation since support of rel-16 monitoring should imply that a UE ‘can’ do rel-16 monitoring, and should not imply that a UE ‘can only do’ rel-16 monitoring. If this interpretation does not hold, then there may need to be explicit signalling for case 1/3 only to cover this specific case.
	+ Component 3 of 11-2 should be per UE.
* Also, component 2 is not necessary (can be removed as it is captured in 38.213)
 |
| [11] | Fine to remove component 2) |
| [13] | * FG 3-5b should be set as the prerequisite feature group for FG 11-2, since FG 3-5b also has the corresponding definition on other aspects on span based PDCCH monitoring, e.g. the number of DCIs to be monitored. If there is no prerequisite here, then we may need to also define some similar restriction here.
* We would prefer to set the type for FG 11-2 as per FS.
* For component 3), we think either per UE or per BC could work.
 |
| [14] | **Proposal:** remove the dependency of FG 11-2 on FG 3-5b, which is reflected in the proposal above.**Reason:** Features 11-2 and 3-5b share the same concept of span pattern (span duration and span gap), but the handling is quite different. For 3-5b, the overbooking/dropping is performed on a per-slot basis, while for 11-2, it is performed on a per-span basis. |
| [15] | * The capability on this FG 11-2 should be reported in the granularity of per UE for all the components
* The dependency of FG 11-2 on FG 3-5b should be removed
	+ With FG 3-5b, the PDCCH overbooking and dropping are performed per slot basis, while per span base is adopted for FG 11-2. UE should be able to enable FG 11-2 no matter whether FG 3-5b is supported or not.
 |
| [16] | * No perquisite FG (3-5b is not related directly to this capability)
* Per FS type of signaling
* No TDD/FDD or FR1/FR2 differentiation is needed.
* Component 3 signaling is per band combination (this may need to be separated as another FG.)
 |
| [17] | Type FS, component 4 is per UE  |

Based on above, following FL proposals are made.

### **Updated FL proposal 2:**

* **Component 2 is removed for FG11-2**
* **A new component on maximum number of DL and UL unicast DCI formats in a span is added**
* **Type of FG11-2 is Per FS for component 1 and per BC for component 3**
* **3-5b is removed from prerequisite feature groups for FG11-2**

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| 11. NR\_L1enh\_URLLC | 11-2 | Rel-16 PDCCH monitoring capability  | 1. Supported combination(s) of (X, Y, μ). For each reported combination, the UE supports the limit C on the maximum number of non-overlapped CCEs for channel estimation per PDCCH monitoring span and the limit M on the maximum number of monitored PDCCH candidates per PDCCH monitoring span
2. Capability on the number of CCs for monitoring a maximum number of BDs and non-overlapped CCEs per span when configured with DL CA with Rel-16 PDCCH monitoring capabi6lity on all the serving cells.
3. Maximum number of DL and UL unicast DCI formats in a span
 |  | Yes | N/A |  | Per FS for component 1Per BC for component 2 | N/A  | N/A  | N/A | This capability is signaled for SCS 15 kHz and 30 kHz. For μ=0 and 1, candidate value set for (X, Y, μ): {(7, 3, μ), (4, 3, μ), (2, 2, μ)}For component 1, a list of separate UE capabilities (X, Y, μ)for processing capability #1;For component 1, a list of separate UE capabilities (X, Y, μ)for processing capability #2;For component 2, if UE supports carrier aggregation with more than 2 DL carriers with Rel-16 PDCCH monitoring capability on all the carriers, UE should report this capability.Candidate value for component 2: {2, 3, …, 16} | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon | Fine with the proposal, though it seems “per BC” for component 2 in the proposal is better. Some additional points for further checking company views:1. Do we need to strictly follow the rule that only one reporting type for a FG? If we have to do that, then component 2 needs to be a separate FG. 2. FG 3-5b also has the corresponding definition on other aspects on span based PDCCH monitoring, e.g. the number of unicast DCIs to be monitored. If there is no prerequisite here, then do we need to also define some similar restriction here?  |
| Qualcomm | * Component 2 should be per BC.
* Also, agree that with separate reporting types, separate FGs might be needed.
* Similar restrictions on number of DCIs, as HW mentioned above, would also be needed.
 |
| Intel | Support FL proposal 2 with following suggested changes:* Change reporting for component 2 to per BC;
* Additions of component from FG 3-5b on max #s of DL and UL unicast DCI formats in a span.
 |
| Moderator (NTT DOCOMO) | The FL proposal is updated according to above comments.* Type of component 2 (3 in original version) is changed to “Per BC”
* Additional component on max number of DL and UL unicast DCI formats in a span is added

Regarding only one reporting type for a FG, my understanding is that it is ok to define different types for different components within a FG, as long as “support/not support of FG” is commonly applicable to all the components in the FG. Defining a certain FG as “conditional mandatory” for UE supporting other FG might be complicated. |
| Nokia, NSB | Unclear motivation for the new added 3rd component “*Maximum number of DL and UL unicast DCI formats in a span*”  |
| Moderator (NTT DOCOMO) | Further discussion on added new component seems necessary. Other parts seems acceptable to all. |
| Apple | Support Proposal 2 in general. Agree with the comments from Huawei/QC/Intel. |
| Samsung | I would like to suggest adding a note to clarify expected configuration when a UE signaled 11-2 in a band and something else in another band in the BC, e.g., 11-2 for B1, and nothing, i.e., rel-15, in B2 for the BC (B1,B2). According to discussion, a UE should only be configured with rel-16 monitoring for the CA configuration if it includes B1. Exemplary wording can be ‘Indicating support of this capability in a band in a BC implies that only rel-16 monitoring can be configured in a CA configuration for the BC if the CA configuration includes the band.’ |
| MediaTek | We agree with updated proposal in general.Also, a new component (or FG) for the support of non-aligned PDCCH spans for CA must be added. |
| Moderator (NTT DOCOMO) | As discussed in GTW session, details on new component or new FG proposal are necessary. |
| Qualcomm#2 | For the range of component 3, we borrow the possible reporting options from 3-5b?  |
| ZTE | Before adding component 3, the UE reporting type and candidate value for component 3 should be first clarified.  |
| Moderator (NTT DOCOMO) | Again, details on new component or new FG proposal are necessary before next GTW session. |
| Apple | Propose to add a component as “Supported span arrangement for CA”, and the value takes {aligned spans only, aligned spans and non-aligned spans}. This is regarding the comment earlier that we want to have either a component or a FG that allows the UE to report that it does not support non-aligned span case.The current component 2 on the capability on number of CCs should be removed, because we have already agreed on this to be a separate FG. |
| Huawei/HiSilicon  | 1. Component 2 “Capability on the number of CCs for monitoring a maximum number of BDs and non-overlapped CCEs per span when configured with DL CA” in the updated FG **should be removed** since we already have FG 11-2a for it. Accordingly the description in the note column and the reporting type column for this component 2 can be removed also.
2. As to the new component “Maximum number of DL and UL unicast DCI formats in a span”, we can use the wording in FG 3-5b instead.

-----------------------------------------------------For the set of monitoring occasions which are within the same span:• Processing one unicast DCI scheduling DL and one unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for FDD• Processing one unicast DCI scheduling DL and two unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for TDD• Processing two unicast DCI scheduling DL and one unicast DCI scheduling UL per scheduled CC across this set of monitoring occasions for TDD-----------------------------------------------------1. As to whether to have a separate FG or a new component for unaligned spans case as proposed by Apple, we would be fine with it for progress though it seems not really necessary from our side. However, I would prefer a separate FG for a clean list. If we add it as a component, we would need to dicsuss whether better to add it under FG 11-2 or FG 11-2a, since FG 11-2 can be used for only single carrier case also. So I would suggest to add a new FG as what MTK proposed in email thread #01.
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## 2.3 FG11-3

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| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-3 | More than one PUCCH for HARQ-ACK transmission within a slot | 1. Supports sub-slot based HARQ-ACK feedback procedure.

• A UL slot consists of a number of sub-slots. No more than one transmitted PUCCH carrying HARQ-ACKs starts in a sub-slot.• At least one sub-slot configuration for PUCCH can be UE specifically configured to a UE. • Supports a single configuration for PUCCH resource for all sub-slots in a slot. The starting symbol of a PUCCH resource is defined with respect to the first symbol of sub-slot. Any sub-slot PUCCH resource is not across sub-slot boundaries. 1. Supported sub-slot configuration
2. [Supported combinations of (A, B), where A is the minimum gap between sub-slots containing actual PUCCH transmissions measured from beginning to beginning of the sub-slots, including across slots, and B is the sub-slot duration, with both A and B in units of symbols]
 |  | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  | Candidate value set for component 2:{ 7-symbol\*2, 2-symbol\*7 and 7-symbol\*2} for NCP or { 6-symbol\*2, 2-symbol\*6 and 6-symbol\*2} for ECP[Candidate value set for component 3]:(A, B) = {(7, 7),(4, 2) and (7, 7),(2, 2) and (7, 7)}]FFS: Whether to keep component 3) and accordingly the above note for component 3)FFS “no more than one transmitted PUCCH carrying HARQ-ACKs starts in a sub-slot” for multi-TRP support” | Optional with capability signalling |

* **Components of FG11-3**
	+ **Component 3 is kept: [8], [13], [14], [16]**
		- **Candidate value set for component 3 is (A, B) = {(7, 7), (4, 2) and (7, 7),(2, 2) and (7, 7)}: [8]**
	+ **Component 3 is removed (as well as notes): [4], [6], [7], [9], [11], [15], [17]**
	+ **FFS: [5], [10]**
* **Reporting type of FG11-3**
	+ **Per UE: [13] (1st priority), [15], [17]**
	+ **Per FS: [5], [9], [13] (2nd priority)**
	+ **Per FSPC: [5], [16]**
* **xDD/FRx diffentiation for FG11-3**
	+ **No differentiation is needed: [5], [9], [15], [16], [17]**
* **Others**
	+ **Clarify whtehr or not to remove the FFS related to multi-TRP support**
		- **The FFS is removed: [4]**
		- **FFS (further discuss): [10]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [4] | **Proposal:** Delete the component 3 and corresponding notes. **Reason:** Once a UE reports the support of a sub-slot configuration, i..e., component 2), the sub-slot based PUCCH pattern is determined by 2-symbol\*7 or 7-symbol\*2. Then, a UE shall be able to transmit sub-slot based PUCCH in part or all of the sub-slots. There is no need to report additional pattern.

|  |
| --- |
| ***Suggested revision #3 on FG 11-3*** |
| Index | Feature group | Components | **Note** |
| 11-3 | More than one PUCCH for HARQ-ACK transmission within a slot | 1. Supports sub-slot based HARQ-ACK feedback procedure.

• A UL slot consists of a number of sub-slots. No more than one transmitted PUCCH carrying HARQ-ACKs starts in a sub-slot.• At least one sub-slot configuration for PUCCH can be UE specifically configured to a UE. • Supports a single configuration for PUCCH resource for all sub-slots in a slot. The starting symbol of a PUCCH resource is defined with respect to the first symbol of sub-slot. Any sub-slot PUCCH resource is not across sub-slot boundaries. 1. Supported sub-slot configuration
2. ~~[Supported combinations of (A, B), where A is the minimum gap between sub-slots containing actual PUCCH transmissions measured from beginning to beginning of the sub-slots, including across slots, and B is the sub-slot duration, with both A and B in units of symbols]~~
 | Candidate value set for component 2:{ 7-symbol\*2, 2-symbol\*7 and 7-symbol\*2} for NCP or { 6-symbol\*2, 2-symbol\*6 and 6-symbol\*2} for ECP~~[Candidate value set for component 3]:~~~~(A, B) =~~ ~~{(7, 7),~~~~(4, 2) and (7, 7),~~~~(2, 2) and (7, 7)}]~~~~FFS: Whether to keep component 3) and accordingly the above note for component 3)~~~~FFS “no more than one transmitted PUCCH carrying HARQ-ACKs starts in a sub-slot” for multi-TRP support”~~ |

 |
| [5] | * To clarify the necessity of component 3)
* Per UE should be changed to Per FS or per FSPC
* No FR1/FR2 differentiation
* No TDD/FDD differentiation
 |
| [6] | Component 3) of feature group 11-3 should not be included. UE performs the sub-slot based HARQ-ACK transmission according to RRC configuration. There has never been any RAN1 agreement about the concept of combinations (A, B), and there is no need to introduce such combinations.1. Delete component 3 of FG 11-3 and the related text in “Note” column.
 |
| [7] | The necessity of this component is not clear to us thus we prefer to remove component 3 in FG 11-3. |
| [8] | * Remove brackets from component 3) “*[3] Supported combinations of (A, B), where A is the minimum gap between sub-slots containing actual PUCCH transmissions measured from beginning to beginning of the sub-slots, including across slots, and B is the sub-slot duration, with both A and B in units of symbols]*”.
* Remove the brackets from the list of candidates in the Note [Candidate value set for component 3]: (A, B) = {(7, 7), (4, 2) and (7, 7),(2, 2) and (7, 7)}]
 |
| [9] | * Remove component 3).
	+ There is no need for this restriction. The impact from “too many PUCCHs” in a slot is mainly relevant to FG 11-4 and FG 11-4a, for which component 6) allows the UE to report a limited number of actual PUCCH transmissions per slot. Enforcing a gap between PUCCH transmissions is neither necessary nor beneficial. For instance, for the case of multiple PUSCHs in a slot, the only limitation is on the number of PUSCHs and there is no restrictions in terms of minimum gaps between two consecutive PUSCHs.
* Reporting is per FS, not per-UE
* No xDD/FRx differentiation needed
 |
| [10] | * Discuss further component 3 (UE can provide a larger (A, B) if UE requires minimum gap).
* Discuss further “No more than one PUCCH with HARQ-ACK per sub-slot” for multi-TRP support.
 |
| [11] | No need of component 3), should be removed |
| [13] | * It seems better to keep component 3. One main benefit to support a 2-symbol sub-slot configuration is that we can start the PUCCH transmission as soon as possible, but it doesn’t mean that UE has to support 7 PUCCHs actual PUCCH transmissions in a slot, since it will increase the UE complexity. For clarification, even for PUCCH transmission, in addition to transmitting PUCCHs itself, we also need to consider the processing of receiving PDSCH and transmitting the corresponding PUCCH, thus more actual PUCCHs in a slot will increase the UE complexity. This is similar to FG 3-5a in Rel-15, which introduces scheduling gap for unicast DCIs.
* As to the reporting type, we think “per UE” would be sufficient. However we are open with “FS” also.
 |
| [14] | **Proposal 3: Include component 3) in FG 11-3 by modifying it to the following: “Supported combinations of (A, B), where A is the minimum gap between sub-slots containing actual PUCCH transmissions carrying any UCI measured from beginning to beginning of the sub-slots, including across slots, and B is the sub-slot duration, with both A and B in units of symbols”.** |
| [15] | * The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
* Component 3 and corresponding note should be removed
 |
| [16] | * Keep component 3
* Signaling type is FSPC
* No TDD/FDD or FR1/FR2 differentiation is needed.
* Further discuss how the capabilities on the number of PUCCHs per slot, the format of PUCCHs per slot, number of times channels can be multiplexed, etc. should be considered for the sub-slot based codebook. To cover these aspects, additional FGs could be needed.
 |
| [17] | component 3 is not needed. Per UE, no xDD/Fry differentiation  |

Based on above, following FL proposals are made.

### **FL proposal 3:**

* **Component 3 is removed for FG11-3**
* **Type of FG11-3 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FFS text is removed from Note for FG11-3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. NR\_L1enh\_URLLC | 11-3 | More than one PUCCH for HARQ-ACK transmission within a slot | 1. Supports sub-slot based HARQ-ACK feedback procedure.

• A UL slot consists of a number of sub-slots. No more than one transmitted PUCCH carrying HARQ-ACKs starts in a sub-slot.• At least one sub-slot configuration for PUCCH can be UE specifically configured to a UE. • Supports a single configuration for PUCCH resource for all sub-slots in a slot. The starting symbol of a PUCCH resource is defined with respect to the first symbol of sub-slot. Any sub-slot PUCCH resource is not across sub-slot boundaries. 1. Supported sub-slot configuration
2.
 |  | Yes | N/A |  | Per UE | No | No | N/A  | Candidate value set for component 2:{ 7-symbol\*2, 2-symbol\*7 and 7-symbol\*2} for NCP or { 6-symbol\*2, 2-symbol\*6 and 6-symbol\*2} for ECP] | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: HW/HiSi, Qualcomm

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon  | 1. Component 3 should be kept. One main benefit to support a 2-symbol sub-slot configuration is that we can start the PUCCH transmission as soon as possible, but it doesn’t mean that UE has to support 7 PUCCHs actual PUCCH transmissions in a slot, since it will increase the UE complexity. However, if we force UE to report 7-symbol sub-slot to reduce the UE complexity, then we cannot achieve the benefits of starting PUCCH as soon as possible to reduce the latency. Therefore, a better way is to allow to configure 2-symbol sub-slot, while let UE to report the maximum actual PUCCHs in a lot.

For clarification on the UE complexity, even for PUCCH transmission, in addition to transmitting PUCCHs itself, we also need to consider the processing of receiving PDSCH and transmitting the corresponding PUCCH, which may have impact on the processing pipeline, thus more actual PUCCHs in a slot will increase the UE complexity |
| Qualcomm | * We propose to keep component 3.
* The signaling type should take the band information into account. Hence, we propose to consider FSPC.
 |
| Intel | We support FL proposal 3. Regarding component 3), we still do not see how this is different from, e.g., case of multiple PUSCHs in a slot. Also, an impact from component 3) would be that certain PUCCH sub-slots will now not be available for PUCCH if the UE-reported limit (assuming it is intended to be smaller than the max supported for a sub-slot configuration) is exceed. The impact from “too many PUCCHs” in a slot is mainly relevant to FG 11-4 and FG 11-4a, for which component 6) allows the UE to report a limited number of actual PUCCH transmissions per slot. |
| Nokia, NSB | We agree with FL proposal. |
| Moderator (NTT DOCOMO) | Further discussion on component 3 seems necessary.Regarding the type, per UE without differentiation seems ok except for Qualcomm. Therefore, my suggestion is to agree on current proposal. Or can e.g., per UE with FR1/FR2 differentiation be possible compromise? |
| Apple | We prefer to keep component 3. But it seems possible to simplify a bit because it provides relaxation for 2-symbol sub-slot only.We propose to consider per FS for the type. Agree with QC that band information should be considered, especially considering that sub-slot based HARQ-ACK feedback may not be necessary for large SCS. |
| Moderator (NTT DOCOMO) | I see several companies prefer to keep component 3, but based on contributions more companies prefer to remove component 3.I’d like to hear more views from other companies.Type is per UE or per FS or per FSPC. At least proponents should provide reason why per FS or per FSPC (just “band information should take into account” may not be sufficient). |
| Qualcomm#2 | As for the type, in bands or BCs with large number of carriers or large BW, the UE’s procesing power is spent on PDCCH/PDSCH decoding. Hence, in some cases, the support of the new codebook or some codebook configurations may not be possible.  |
| ZTE | We agree to remove component 3. So, we support the current FL proposal.  |
| Moderator (NTT DOCOMO) | Based on feedbacks so far,* Support per UE without xDD/FRx differentiation: Huawei, HiSi, Intel, Nokia, NSB, ZTE
* Support per FSPC: Qualcomm
* Support per FS: Apple

So, still suggestion from moderator is to agree on current proposal. If it is not acceptable, compromised proposal (e.g., per UE with FRx differentiation) is necessary. |
| Nokia, NSB | We support FL proposal. |
| Apple | We see this FG as somewhat related to UE processing capability, because it requires the UE to do the processing (at least for UCI) on per-sub-slot granularity instead of per-slot, and the resource may be shared with other processing. It would make sense to have the same granularity as e.g. UE processing time capability 2, i.e., per FS. Also it should definitely depend on band info, because it may not make sense to support this feature in FR2. |
| Huawei, HiSilicon  | 1.  **Component 3 as below should be kept**. * Firstly, the component 3 is to define not only the number of PUCCHs per slot, but also the gap between two actual PUCCHs, which is very important for UE capability, because we also need to consider the preocssing UE needs to do from receving the PDSCH to transmit PUCCH, not just transmit PUCCH itself. To support back-to-back PUCCHs, then it will have impact on the processing pipeline, which will result in difficulty to handle the processing with one processing unit. Increase more processing unit for sure will increase the UE complexity.
* Secondly, keep component 3) is beneficial from URLLC perspective, it can enable a UE that cannot support 7 actual PUCCHs in a lot can still operate with 2 symbol sub-slot, which can enable starting the PUCCH transmission asap to reduce the lateny, and which is actually the main motivation for sub-slot HARQ-ACK feedback.
* There was comment before that back to back PUCCHs in different slots is supported in Rel-15. However, in Rel-15 case probably is not typical case, once it happens still some chance for UE to handle by borrowing capability from some other place, also in rel-15 probably capability # 1 will be used which leave more room for UEs to do some extra random happen thing.
1. As to the reporting type, we are fine to compromise to FS as proposed by Apple.
 |

## 2.4 FG11-4/4a/[4b]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-4 | Two HARQ-ACK codebooks with up to one sub-slot based HARQ-ACK codebook (i.e. slot-based + slot-based, or slot-based + sub-slot based) simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed with the restriction up to one sub-slot based HARQ-ACK codebook.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. [Supports a DCI format (from the formats 1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured per BWP]
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. [Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot]
 | [11-3] (TBD) | Yes | N/A |  | FFS [Per UE or Per FS] | [No] | [No] | [N/A]  | [If a UE reports both 11-3 and 11-4, it can support two slot-based HARQ-ACK codebooks, and one slot-based and one-sub-slot-based HARQ-ACK codebooks. If a UE reports 11-4 but not 11-3, it can only support two slot-based HARQ-ACK codebooks.] | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-4a | Two sub-slot based HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two sub-slot based HARQ-ACK codebooks with different priorities to be simultaneously constructed.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. [Supports a DCI format (from the formats /1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured in USS per BWP]
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. [Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot]
 | [11-3] and [11-4] (TBD) | Yes | N/A |  | FFS [Per UE or Per FS] | [No] | [No] | [N/A] |  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | [11-4b] | [DL priority indication in DCI with mixed DCI formats] | [DL priority indication in DCI with mixed DCI formats] | 11-1a, 11-4 (TBD) | Yes | N/A |  | Per UE | [No] | [No] | [N/A]  |  | Optional with capability signalling |

* **Components of FG11-4**
	+ **Component 4**
		- **Component 4 is kept: [4], [5], [7], [8], [9], [10], [13], [14], [16]**
		- **Component 4 is removed: [15]**
		- **FFS: [11]**
	+ **Component 6**
		- **Component 6 is kept: [5], [9], [10], [13]**
		- **Component 6 is removed: [4], [6], [8]**
		- **FFS: [14], [15], [17]**
	+ **New component(s)**
		- **Add “Supports a DCI format 1\_2 scheduling PDSCH with different HARQ-ACK priorities and DCI format 1\_1 scheduling PDSCH with low priority only when DCI formats 0\_1/1\_1 and DCI formats 0\_2/1\_2 are configured in a DL BWP”: [9]**
		- **Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK”: [7], [14]**
* **Components of FG 11-4a**
	+ - **Component 4 is kept: [4], [5], [7], [9], [10], [16]**
		- **Component 4 is removed: [14], [15]**
		- **FFS: [11]**
	+ **Component 6**
		- **Component 6 is kept: [5], [8], [9], [10]**
		- **Component 6 is removed: [4], [6], [13]**
		- **FFS: [14] , [15]**
	+ **New component(s)**
		- **Add “Supports a DCI format 1\_2 scheduling PDSCH with different HARQ-ACK priorities and DCI format 1\_1 scheduling PDSCH with low priority only when DCI formats 0\_1/1\_1 and DCI formats 0\_2/1\_2 are configured in a DL BWP”: [9]**
		- **Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK”: [7]**
* **Prerequisite feature groups for FG11-4**
	+ **FG11-3 is kept: [4]**
	+ **FG 11-3 is removed: [5], [7], [8], [9], [10], [13], [14], [16], [17]**
* **Prerequisite feature groups for FG11-4a**
	+ **FG11-3 and FG 11-4 are kept: [4], [7], [8], [9], [14]**
	+ **FG 11-3 is removed: [5], [10], [16], [17]**
	+ **FFS whether 11-4 is kept or removed: [13]**
* **Reporting type of FG11-4**
	+ **Per UE: [4], [13], [15]**
	+ **Per FS: [5], [8], [9], [13], [14]**
	+ **Per FSPC: [5], [16]**
* **Reporting type of FG11-4a**
	+ **Per UE: [4], [13], [15]**
	+ **Per FS: [5], [8], [9], [13], [14]**
	+ **Per FSPC: [5], [16]**
* **xDD/FRx diffentiation for FG11-4/4a**
	+ **No differentiation is needed: [5], [9], [15], [16],**
* **Note for FG11-4**
	+ **The note is kept: [7], [8], [13], [14], [17]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [3] | On FG 11-4, two HARQ-ACK codebooks simultaneously constructed for supporting PDSCH reception with different priorities at a UE is agreed. However, we think it is better it is better to supportcombinations in component.**Proposal 2:** as for FG11-4 and FG11-4X, it is better to support combinations in component. |
| [4] | * For FG 11-4/4a,
* Keep component 4 as the priority indication for mixed DCI formats is agreed as a UE capability.
* Delete component 6 since the maximum number of PUCCHs supported is determined by FG 11-3.
* Prerequisite feature groups is set to 11-3 for FG 11-4, and set to 11-3 and 11-4 for FG 11-4a.
* Per UE report is supported.
* For FG 11-4b, we don’t see the necessity to separate priority indication between DL and UL in mixed DCI formats.

|  |
| --- |
| *Suggested revision #6 on FG 11-4a* |
| Index | Feature group | Components | Prerequisite feature groups |
| ~~[~~11-4b~~]~~ | ~~[DL~~ priority indication in DCI with mixed DCI formats~~]~~ | ~~[DL priority indication in DCI with mixed DCI formats]~~Monitoring a DCI format (from the formats 0\_1/1\_1/0\_2/1\_2) scheduling PDSCH with different HARQ-ACK priorities or PUSCH with different priorities when both DCI format 0\_1/1\_1 and DCI format 0\_2/1\_2 are configured to be monitored per BWP  | 11-1a, 11-4 ~~(TBD)~~ |

 |
| [5] | * FG 11-4/4a
	+ Remove pre-requisite 11-3
	+ Keep component 4) and 6)
	+ Per FS or per FSPC
	+ No FR1/FR2 differentiation
	+ No TDD/FDD differentiation
* FG 11-4b
	+ Keep 11-4b as a separate UE feature, and to clarify the understanding of 11-4b as the following
		- If a UE is capable of 11-4b, the UE is expected to follow the explicitly indicated priority (low or high) for PDSCH in the scheduling DCI format of DCI format 1\_1 and DCI format 1\_2
		- If a UE is not capable of 11-4b (but capable of 11-1a), the UE is expected to assume low priority for PDSCH for DCI format 1\_1, and to follow the indicated priority (low or high) for PDSCH in the scheduling DCI format for DCI format 1\_2.
	+ No FR1/FR2 differentiation
	+ No TDD/FDD differentiation
 |
| [6] | For FG 11-4 and 11-4a, component 6) (in bracket) should not be introduced. The slot / sub-slot configuration of HARQ-ACK codebook will define the maximum number of PUCCH transmissions for HARQ-ACK within a slot. There is no need to introduce component 6).1. For FG 11-4 and 11-4a, do not introduce a component for “Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot”.
 |
| [7] | Following updates are proposed.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11-4 | Two HARQ-ACK codebooks with up to one sub-slot based HARQ-ACK codebook (i.e. slot-based + slot-based, or slot-based + sub-slot based) simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed with the restriction up to one sub-slot based HARQ-ACK codebook.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. ~~[~~Supports a DCI format (from the formats 1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured per BWP~~]~~
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. [Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot]
7. Prioritization between UL channels/signals with different PHY priority levels
8. Additional number of symbols (d1) needed beyond the PUSCH preparation time for cancelling a low priority UL transmission.
9. Additional number of symbols (d2) needed beyond the PUSCH preparation time for scheduling a high priority UL transmission that cancels a low priority UL transmission
 | ~~[11-3] (TBD)~~ | Yes | N/A |  | FFS [Per UE or Per FS] | [No] | [No] | [N/A]  | ~~[~~If a UE reports both 11-3 and 11-4, it can support two slot-based HARQ-ACK codebooks, and one slot-based and one-sub-slot-based HARQ-ACK codebooks. If a UE reports 11-4 but not 11-3, it can only support two slot-based HARQ-ACK codebooks.~~]~~ | Optional with capability signalling |
| 11-4a | Two sub-slot based HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two sub-slot based HARQ-ACK codebooks with different priorities to be simultaneously constructed.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. ~~[~~Supports a DCI format (from the formats /1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured in USS per BWP~~]~~
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. [Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot]
7. Prioritization between UL channels/signals with different PHY priority levels
8. Additional number of symbols (d1) needed beyond the PUSCH preparation time for cancelling a low priority UL transmission.
9. Additional number of symbols (d2) needed beyond the PUSCH preparation time for scheduling a high priority UL transmission that cancels a low priority UL transmission
 | ~~[~~11-3~~]~~ and ~~[~~11-4~~] (TBD)~~ | Yes | N/A |  | FFS [Per UE or Per FS] | [No] | [No] | [N/A] |  | Optional with capability signalling |
| [11-4b] | [DL priority indication in DCI with mixed DCI formats] | [DL priority indication in DCI with mixed DCI formats] | 11-1a, 11-4 (TBD) | Yes | N/A |  | Per UE | [No] | [No] | [N/A]  |  | Optional with capability signalling |

 |
| [8] | * FG 11-4
	+ FG11-3 is not a prerequisite for FG11-4. Remove the brackets“[If a UE reports both 11-3 and 11-4, it can support two slot-based HARQ-ACK codebooks, and one slot-based and one-sub-slot-based HARQ-ACK codebooks. If a UE reports 11-4 but not 11-3, it can only support two slot-based HARQ-ACK codebooks.]”
	+ Set the capability type to FS.
	+ Remove Component 6) “Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot”. If the UE is not supporting FG11-3, the maximum number of PUCCHs per slot will be 2. If the UE supports FG11-3 and FG11-4, the maximum number of PUCCH slot will be what is reported in FG11-3 plus 1.
	+ Remove the brackets from “[Supports a DCI format (from the formats 1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured per BWP]”. The priority indication in DCI as per RAN1 agreement.
* FG 11-4a
	+ Set the capability type to FS.
	+ Remove the brackets from “Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot”.
	+ FG11-4 is prerequisite for FG11-4a.
	+ FG11-3 is prerequisite for FG11-4a.
* FG 11-4b
	+ OK to keep the feature.
	+ TDD/FDD and FR1/FR2 differentiation is needed.
	+ Don’t link any DCI format to any priority level. No RAN1 agreement to indicate priority by DCI format. The description should be based on RAN1 agreements and there is no link between the DI formats and the priority levels.
	+ The phrase “mixed DCI formats” should be clarified by replacing the component as: “Dynamic indication of high or low priority for HARQ-ACK feedback in DCI scheduling PDSCH when configured to monitor both sets of DCI formats 0\_1/1\_1 and 0\_2/1\_2 in a BWP”.
 |
| [9] | * FG 11-4
	+ Remove brackets for component 4) as this is perfectly aligned with RAN1 agreements
	+ An additional component should be added as following to cover the case wherein the UE may be configured with both sets of DCI formats 0\_1/1\_1 and 0\_2/1\_2:
		- Component 7) Supports a DCI format 1\_2 scheduling PDSCH with different HARQ-ACK priorities and DCI format 1\_1 scheduling PDSCH with low priority only when DCI formats 0\_1/1\_1 and DCI formats 0\_2/1\_2 are configured in a DL BWP
	+ Keep component 6)
	+ Reporting is per FS
	+ No xDD/FRx differentiation needed
	+ Remove 11-3 from pre-requisite
* FG 11-4a
	+ Remove brackets for component 4) as this is perfectly aligned with RAN1 agreements
	+ An additional component should be added as following to cover the case wherein the UE may be configured with both sets of DCI formats 0\_1/1\_1 and 0\_2/1\_2:
		- Component 7) Supports a DCI format 1\_2 scheduling PDSCH with different HARQ-ACK priorities and DCI format 1\_1 scheduling PDSCH with low priority only when DCI formats 0\_1/1\_1 and DCI formats 0\_2/1\_2 are configured in a DL BWP
	+ Keep component 6)
	+ Reporting is per FS
	+ No xDD/FRx differentiation needed
	+ Confirm FGs 11-3 and 11-4 as pre-requisites
* FG 11-4b
	+ The phrase “mixed DCI formats” should be clarified by replacing the component as: “**Dynamic indication of high or low priority for HARQ-ACK feedback in DCI scheduling PDSCH** **when configured to monitor both sets of DCI formats 0\_1/1\_1 and 0\_2/1\_2 in a BWP** ~~DL priority indicationwith mixed DCI formats~~”.
	+ FGs **11-4** and **11-1** should be the pre-requisites; FG 11-1a should be changed to FG 11-1 (11-1a is about monitoring both sets of DCI formats **in the same SS set**, while this FG 11-4b is about monitoring both sets of DCI formats **in the same DL BWP**
 |
| [10] | * FG 11-4
	+ Add component “Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot”
	+ Remove 11-3 as a prerequisite
	+ Add to component 4: When the UE does not support dynamic priority indication per DCI format, DCI format from 1\_1 indicates low priority and DCI format 1\_2 indicates high priority (exact method for indicating low/high priority when UE does not support dynamic priority indication per DCI format needs to be concluded in RAN1).
* FG 11-4a
	+ Add component “Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot”
	+ Remove 11-3 as a prerequisite
	+ Add to component 4: When the UE does not support dynamic priority indication per DCI format, DCI format from 1\_1 indicates low priority and DCI format 1\_2 indicates high priority (exact method for indicating low/high priority when UE does not support dynamic priority indication per DCI format needs to be concluded in RAN1)
 |
| [11] | * FG 11-4
	+ Need further discussion on component 4)
* FG 11-4a
	+ Update FG description as “Two sub-slot based HARQ-ACK codebooks simultaneously constructed for supporting PUCCH transmission associated with HARQ-ACK codebooks with different priorities at a UE”
	+ Need further discussion on component 4)
* FG 11-4b
	+ Share the similar view with Intel. Update FG description as “Dynamic indication of 2-level PHY priority for HARQ-ACK feedback in DCI scheduling PDSCH when configured to monitor both sets of DCI formats 0\_1/1\_1 and 0\_2/1\_2 in a BWP”
	+ FG 11-1 and 11-4 should be the prerequisites.
 |
| [13] | * FG 11-4
	+ As to component 4, we slightly prefer to remove the bracket directly. However, we are fine to only keep DCI format 1\_1 and DCI format 1\_2 in FG 11-4 since FG 11-4 is mainly for PDSCH with different HARQ-ACK priorities, and add a similar component for DCI format 0\_1 and DCI format 0\_2 in FG 12-1.
	+ We are fine with the note in the note column. With this note, then there is no need to set FG 11-3 as the prerequisite of FG 11-4.
	+ As to component 6, we would prefer to keep it. Though if UE also supports FG11-3, then we can further clarify whether component 3 given in FG 11-3 covers the PUCCHs for both HARQ-ACK codebook or not.
	+ As to the reporting type, we think “per UE” would be sufficient. However we are open with “FS” also. Similar view for FG 11-4a.
* FG 11-4a
	+ The motivation to add FG 11-4 as the prerequisite needs to be clarified first. In our understanding, FG 11-3 should be the prerequisite since sub-slot based HARQ-ACK should be based on sub-slot based HARQ-ACK transmission.
	+ As to component 6, since FG 11-3 will be the prerequisite, then probably it is not needed as long as component 3 in FG 11-3 includes covers the PUCCH for all HARQ-ACK codebooks.
* FG 11-4b
	+ We are fine to keep FG 11-4b though not really necessary to split DL and UL from our perspective. As to the component, better to reflect what exactly in the agreement.
 |
| [14] | Following updates are proposed.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11-4 | Two HARQ-ACK codebooks with up to one sub-slot based HARQ-ACK codebook (i.e. slot-based + slot-based, or slot-based + sub-slot based) simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed with the restriction up to one sub-slot based HARQ-ACK codebook.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. ~~[~~Supports a DCI format (from the formats 1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only one of the DCI formats 1\_1 and 1\_2 ~~DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2~~ is configured per BWP~~]~~
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. [Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot]
7. Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK
	1. Multiplexing/prioritization between UL channels/signals with the same PHY priority level
	2. Prioritization between UL channels/signals with different PHY priority levels
	3. Additional number of symbols (d1) needed beyond the PUSCH preparation time for cancelling a low priority UL transmission.
	4. Additional number of symbols (d2) needed beyond the PDSCH processing time for scheduling a high priority HARQ-ACK transmission that cancels a low priority UL transmission
 | ~~[11-3] (TBD)~~ | Yes | N/A |  | ~~FFS [Per UE or Per FS]~~Per FS | [No] | [No] | [N/A]  | ~~[~~If a UE reports both 11-3 and 11-4, it can support two slot-based HARQ-ACK codebooks, and one slot-based and one-sub-slot-based HARQ-ACK codebooks. If a UE reports 11-4 but not 11-3, it can only support two slot-based HARQ-ACK codebooks.~~]~~Candidate value for d1: {0, 1, 2}Candidate value for d2: {0, 1, 2} | Optional with capability signalling |
| 11-4a | Two sub-slot based HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two sub-slot based HARQ-ACK codebooks with different priorities to be simultaneously constructed.
2. ~~Supports separate PUCCH configuration for different HARQ-ACK codebooks~~
3. ~~Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.~~
4. ~~[Supports a DCI format (from the formats /1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured in USS per BWP]~~
5. ~~Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.~~
6. [Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot]
 | ~~[~~11-3~~]~~ and ~~[~~11-4] ~~(TBD)~~ | Yes | N/A |  | ~~FFS [Per UE or Per FS]~~Per FS | [No] | [No] | [N/A] |  | Optional with capability signalling |
| ~~[~~11-4b~~]~~ | ~~[DL~~ HARQ-ACK priority indication in DCI with mixed DCI formats~~]~~ | ~~[DL~~ HARQ-ACK priority indication in DCI when both DCI formats 1\_1 and 1\_2 are configured per BWP ~~with mixed DCI formats]~~ | 11-1a, 11-4 (TBD) | Yes | N/A |  | Per UE | [No] | [No] | [N/A]  |  | Optional with capability signalling |

 |
| [15] | * FG 11-4
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
	+ Component 4 should be removed, i.e., irrespective of whether only one of DCI format 0\_1/1\_1 or DCI format 0\_2/1\_2 is configured or both DCI formats are configured in USS, FG 11-4 should be supported.
	+ Clarification on component 6 in FG 11-4 with component 3 in FG 11-3 is necessary. In our understanding, one of them is necessary in the UE feature, e.g., when a UE supports (A, B) = (4, 2) in FG 11-3, the UE shall support maximum 4 actual PUCCH transmissions for HARQ-ACK within a slot in FG 11-4. The other way is that when UE supports maximum 4 actual PUCCH transmissions for HARQ-ACK within a slot in FG 11-4 and supports the sub-slot configuration of 2-symbol\*7 in FG 11-3, at most 4 PUCCH transmissions in sub-slots can be scheduled without gaps. Among these 2 interpretations, we prefer latter one, i.e., remove component 3 in FG 11-3 and remove the bracket of component 6 in FG 11-4.
* FG 11-4a
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
	+ Component 4 should be removed, i.e., irrespective of whether only one of DCI format 0\_1/1\_1 or DCI format 0\_2/1\_2 is configured or both DCI formats are configured in USS, FG 11-4a should be supported.
	+ Clarification on component 6 in FG 11-4a with component 3 in FG 11-3 is necessary. In our understanding, one of them is necessary in the UE feature, e.g., when a UE supports (A, B) = (4, 2) in FG 11-3, the UE shall support maximum 4 actual PUCCH transmissions for HARQ-ACK within a slot in FG 11-4a. The other way is that when UE supports maximum 4 actual PUCCH transmissions for HARQ-ACK within a slot in FG 11-4a and supports the sub-slot configuration of 2-symbol\*7 in FG 11-3, at most 4 PUCCH transmissions in sub-slots can be scheduled without gaps. Among these 2 interpretations, we prefer latter one, i.e., remove component 3 in FG 11-3 and remove the bracket of component 6 in FG 11-4a.
* FG 11-4b
	+ We are OK to remove the bracket, i.e., keep this FG.
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
 |
| [16] | * FG 11-4
	+ Add the following to component 4 “When two DCI formats are configured, but the UE does not support dynamic priority indication per DCI format, only one DCI format from 1\_1/1\_2 can indicate low priority and the other one can only indicate high priority.”
	+ Signaling type is FSPC
	+ No TDD/FDD or FR1/FR2 differentiation is needed.
	+ FG 11-3 from the perquisite column should be removed.
	+ Further discuss how the capabilities on the number of PUCCHs per slot, the format of PUCCHs per slot, number of times channels can be multiplexed, etc. should be considered for the sub-slot based codebook. To cover these aspects, additional FGs could be needed.
* FG 11-4a
	+ Add the following to component 4 “When two DCI formats are configured, but the UE does not support dynamic priority indication per DCI format, only one DCI format from 1\_1/1\_2 can indicate low priority and the other one can only indicate high priority.”
	+ Signaling type is FSPC
	+ No TDD/FDD or FR1/FR2 differentiation is needed.
	+ FG 11-3 from the perquisite column should be removed.
	+ Further discuss how the capabilities on the number of PUCCHs per slot, the format of PUCCHs per slot, number of times channels can be multiplexed, etc. should be considered for the sub-slot based codebook. To cover these aspects, additional FGs could be needed.
* FG 11-4b
	+ Keep this FG
	+ Signaling type is FSPC
	+ No TDD/FDD or FR1/FR2 differentiation is needed.
	+ Add the following for clarity in the note column: “Note: For a UE supporting this feature, one DCI format indicates low priority level and one DCI format indicates high priority level”
 |
| [17] | * FG11-4
	+ Some more discussion /clarification on component 6 may be needed. Is this maximum number of actual repetitions for a TB or across all PUSCHs/TBs per slot?
	+ The note is fine but in this case 11-3 should not be a pre-requisite
* FG 11-4a
	+ 11-4 should be a pre-requisite FG
* FG 11-4b
	+ OK to keep the FG. Per UE, no xDD/Fry differentiation
 |

Based on above, following FL proposals are made.

**FL proposal 4:**

* **Component 4 and 6 are kept for FG11-4/4a**
* **Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK” as new component for FG11-4**
* **FG11-3 is removed from prerequisite feature groups for FG11-4**
* **FG11-3 and 11-4 are prerequisite feature groups for FG11-4a**
* **Type of FG11-4/4a is Per FS**
* **The bracket is removed from Note for FG11-4**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. NR\_L1enh\_URLLC | 11-4 | Two HARQ-ACK codebooks with up to one sub-slot based HARQ-ACK codebook (i.e. slot-based + slot-based, or slot-based + sub-slot based) simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed with the restriction up to one sub-slot based HARQ-ACK codebook.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. Supports a DCI format (from the formats 1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured per BWP
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot
7. Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK
 |  | Yes | N/A |  | Per FS | N/A | N/A | N/A | If a UE reports both 11-3 and 11-4, it can support two slot-based HARQ-ACK codebooks, and one slot-based and one-sub-slot-based HARQ-ACK codebooks. If a UE reports 11-4 but not 11-3, it can only support two slot-based HARQ-ACK codebooks | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-4a | Two sub-slot based HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two sub-slot based HARQ-ACK codebooks with different priorities to be simultaneously constructed.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. Supports a DCI format (from the formats /1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured in USS per BWP
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot
 | 11-3 and 11-4 | Yes | N/A |  | Per FS | N/A | N/A | N/A |  | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm, Nokia/NSB

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon | We are fine with the FL proposal 4 in principle. Some editorial clarification:1. Since now 11-4 is only for supporting HARQ-ACK codebooks with different priorities, it seems better to update component 4 as below:

4) Supports a DCI format (from the formats ~~0\_1/~~1\_1/~~0\_2/~~1\_2) scheduling PDSCH with different HARQ-ACK priorities ~~or PUSCH with different priorities~~ when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured per BWP.  |
| Qualcomm | For 11-4:* We propose to remove component 7
* Agree with HW on the clarification for component 4.
* Add a component, similar to 11-3, to report the subslot configuration.
* For the type, we prefer FSPC.

For 11-4a:* The same modification for component 4 is needed.
* Add a component, similar to 11-3, to report the subslot configuration.
* For the type, we prefer FSPC.
* Prequisites should be removed.
 |
| Intel | We support FL proposal 4 with the suggested edits from Huawei. |
| Nokia, NSB | It is not clear why the type would need to be per FS. It should be sufficient to be per UE as those are baseband capabilities. |
| Moderator (NTT DOCOMO) | Suggested modification to component 4 has already been made.Further discussion on newly added component as well as another potential component suggested by Qualcomm seems necessary.Regarding the type, per UE without differentiation seems ok except for Qualcomm. Therefore, my suggestion is to agree on current proposal. Or can e.g., per UE with FR1/FR2 differentiation be possible compromise?Regarding prerequisites for FG11-4a, let’s check if it is ok to be removed. |
| Apple | Support the latest suggestion by Moderator, assuming component 4 has already been made. I assume Moderator’s intention is to say “per FS” instead of “per UE”, because “per FS” was proposed in the proposal above. |
| Huawei, HiSilicon  | Fine with the proposal in principle, except that component 6 may need some further discussion. Note that companies may also prefer to wait the outcome from UCI first before deciding whether/how to keep component 4. 1. For FG 11-4/4a, as to whether/how to keep component 6 here, it would depend on how to interpretate component 3 in FG 11-3. If component 3 is only for single HARQ-ACK codebook, then component 6 should be kept here also.
2. For FG 11-4/4a, since as long as sub-slot based HARQ-ACK codebook is supported, then UE will support FG 11-3 also, it seems not necessary to report the supported sub-slot configuration here again. But we are open with it.
 |

Based on discussion in GTW session, following agreements were made.

**Agreements:**

* **FFS: Component 4 and 6 are kept for FG11-4/4a**
* **FFS: Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK” as new component for FG11-4**
* **FG11-3 is removed from prerequisite feature groups for FG11-4**
* **FFS: FG11-3 and 11-4 are prerequisite feature groups for FG11-4a**
* **FFS: Type of FG11-4/4a is Per FS**
* **The bracket is removed from Note for FG11-4**

### **Updated FL proposal 4:**

* **Component 4 is kept for FG11-4/4a**
* **Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK” as new component for FG11-4**
* **FG11-3 and 11-4 are prerequisite feature groups for FG11-4a**
* **Type of FG11-4/4a is Per FS**
	+ **Add a note “Per FS is selected because in bands or BCs with large number of carriers or large BW, the UE’s procesing power is spent on PDCCH/PDSCH decoding, and hence in some cases the support of the new codebook or some codebook configurations may not be possible”**

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals:

|  |  |
| --- | --- |
| Company | Comment |
| Qualcomm | For 11-4, we do not think that component 6 is needed. Network should be able to TDM transmissions if the UE does not support intra-UE prioritization.Per FS signling for the same reasons mentioned in our response to FG 11-3. Regarding prequisite FGs of FG11-4a, is it that if the UE supports FG 11-4a, it has to support all possible combinations of subslot CBs? |
| ZTE | We have agreed separate FG 11-4b~11-4h about the number of PUCCH transmissions supported in one slot/subslot. So, component 6 should be removed. |
| Moderator (NTT DOCOMO) | Based on above feedbacks, component 6 is removed from the proposal.Regarding type, based on feedbacks so far* Support per FS: Qualcomm, Apple, Huawei, HiSi, Intel
* Support per UE: Nokia, NSB

So, my suggestion is to agree on current FL proposal with reason for per FS. Or can we have per UE with FR1/FR2 differentiation as compromise? |
| Nokia, NSB | The motivation for FS is a bit confusing given that it is not directly related to the FG itself, but to general baseband processing availability due to other processing assumptions.  |

|  |  |
| --- | --- |
| Apple | Regarding the proposed new component “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK”, the intention is to make this FG independent from 12-1. QC suggested that network can do TDM. Does it mean there is no overlapping of high priority HARQ-ACK with any other low priority channels in time? In this case, why the need to even configure two priorities?If there is strong concern to include the new component, another approach is to create a separate FG for this component that has 11-4 as pre-requisite. For us, it is important to be able to decouple the handling of HARQ-ACK priority and SR/PUSCH priority. If such a component is not available here, it would mean that the full operation of two-level HARQ-ACK priorities would not be possible unless the UE also reports 12-1. This creates unnecessary dependency. |
| Huawei, HiSilicon  | Fine with the proposal in principle. Note that companies may also prefer to wait the outcome from UCI first before deciding whether/how to keep component 4.In addition, **we would prefer to keep component 6) open**, since whether/how to keep it would depend on the outcome of component 3 in FG 11-3 and the interpretation of the working assumption we made before. 1. For FG 11-4/4a, as to whether/how to keep component 6 here, it would depend on how to interpretate component 3 in FG 11-3. If component 3 is only for single HARQ-ACK codebook, then component 6 should be kept here also.
2. For FG 11-4/4a, since as long as sub-slot based HARQ-ACK codebook is supported, then UE will support FG 11-3 also, it seems not necessary to report the supported sub-slot configuration here again. But we are open with it.
 |

## 2.5 FG11-6

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-6 | PUSCH repetition Type A | 1. PUSCH transmission with Rel-15 behavior with or without slot aggregation.

• With slot aggregation, the number of repetitions can be dynamically indicated (as agreed for Rel-16).• When dynamically indicated, the number of repetitions is jointly coded with SLIV in TDRA table, by adding an additional column for the number of repetitions in the TDRA table. | [5-17] | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  | FFS: Whether to add a component for the supported maximum number of PUSCH repetitions | Optional with capability signalling |

* **Whether or not to introduce a new component for the supported maximum number of PUSCH repetitions**
	+ **Introduce: [16]**
	+ **Not introduce (remove the corresponding note): [9], [15]**
	+ **FFS: [13]**
* **Prerequisite feature groups for FG11-6**
	+ **5-17 is kept: [9], [15]**
	+ **5-16 and 5-17: [13]**
* **Reporting type of FG11-6**
	+ **Per UE: [9], [15], [17]**
	+ **Per band: [16]**
* **xDD/FRx diffentiation for FG11-6**
	+ **No differentiation is needed: [9], [16], [17]**
	+ **Differentiation is needed: [8]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [3] | Regarding FG11-6, we think it is fine to keep it. |
| [8] | TDD/FDD and FR1/FR2 differentiation is needed |
| [9] | * Pre-requisite should be FG 5-17
* Per UE
* No xDD/FRx differentiation
* Delete the text in the Notes column – no need for new component for supported number of PUSCH repetitions.
 |
| [11] | Similar to 5-17, 5-16 also needs to be considered as prerequisite. At least, it could be necessary to add note, “A UE supporting this feature and 5-20 shall also support 5-16” |
| [13] | * We are ok to set FG 5-17 as the prerequisite feature group for FG 11-6.
* As to “Whether to add a component for the supported maximum number of PUSCH repetitions”, we are open to discuss it.
 |
| [15] | * Confirm the dependency in the perquisite feature groups column.
* The capability on this FG 11-6 should be reported in the granularity of per UE
* Regarding the FFS, we do not think it is necessary
 |
| [16] | * Add component 2 for reporting the maximum number of PUSCH repetitions
* Signaling type is per band
* No TDD/FDD or FR1/FR2 differentiation is needed.
 |
| [17] | per UE, no xDD/Fry differentiation  |

Based on above, following FL proposals are made.

**FL proposal 5:**

* **Type of FG11-6 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FG5-17 is a prerequisite feature group for FG11-6**
* **FFS text is removed from the Note for FG11-6**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. NR\_L1enh\_URLLC | 11-6 | PUSCH repetition Type A | 1. PUSCH transmission with Rel-15 behavior with or without slot aggregation.

• With slot aggregation, the number of repetitions can be dynamically indicated (as agreed for Rel-16).• When dynamically indicated, the number of repetitions is jointly coded with SLIV in TDRA table, by adding an additional column for the number of repetitions in the TDRA table. | 5-17 | Yes | N/A |  | Per UE | No | No | N/A  |  | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon  | Support the FL proposal.  |
| Qualcomm | * We propose to add a component for the number of PUSCH repetitions
* The type should be per band.
 |
| Intel | We support FL proposal 5. |
| Nokia, NSB | We support FL proposal |
| Moderator (NTT DOCOMO) | The situation is only one company proposes to add a component for number of PUSCH repetitions and to change the type to per band.Therefore, my suggestion is to agree on current proposal. Or can e.g., per UE with FR1/FR2 differentiation be possible compromise? |
| Apple | Support Proposal 5 |
| Qualcomm2 | On the type, why should the UE support the URLLC related features in all bands?  |
| ZTE | Support  |

Based on discussion in GTW session, following agreements were made.

**Agreements:**

* **FFS: Type of FG11-6 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FFS: FG5-17 is a prerequisite feature group for FG11-6**
* **FFS text is removed from the Note for FG11-6**

### **Updated FL proposal 5:**

* **Type of FG11-6 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FG5-17 is a prerequisite feature group for FG11-6**

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals:

|  |  |
| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | There is clear majority support on “Per UE without xDD/FRx differentiation”. I suggest to agree on it. Or can we have FR1/FR2 differentiation as compromise? |
| Nokia, NSB | Support FL proposal |
| Apple | Support |
| Huawei, HiSilicon | Support  |

## 2.6 FG11-7/7a/[7b]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-7 | UL cancelation scheme for self-carrier | 1. Supports group common DCI (i.e. DCI format 2\_4) for cancelation indication [on the same DL CC as that scheduling PUSCH or SRS]
2. UL cancelation for PUSCH
* Cancellation is applied to each PUSCH repetition individually in case of PUSCH repetitions
1. UL cancelation for SRS symbols that overlap with the cancelled symbols

[For the serving cell, the UE determines the first symbol of the $T\_{CI}$ symbols to be the first symbol that is after $T\_{proc,2}+d$ from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where $d$ is provided by higher layer.]  |  | Yes | N/A |  | [Per UE]FFS: FS | [No] | [No] | [N/A]  | [More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b]  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-7a | UL cancelation scheme for cross-carrier | 1. Supports group common DCI (i.e. DCI format 2\_4) for cancelation indication [on a different DL CC than that scheduling PUSCH or SRS]
2. UL cancelation for PUSCH
* Cancellation is applied to each PUSCH repetition individually in case of PUSCH repetitions
1. UL cancelation for SRS symbols that overlap with the cancelled symbols

[For the serving cell, the UE determines the first symbol of the $T\_{CI}$ symbols to be the first symbol that is after $T\_{proc,2}+d$ from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where $d$ is provided by higher layer.]  |  | Yes | N/A |  | [Per UE]FFS: FS | [No] | [No] | [N/A]  | [More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b]  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | [11-7b] | [Independent cancellation of the overlapping PUSCHs in an intra-band UL CA] | [For a UE indicating the capability of pa-PhaseDiscontinuityImpacts, and if the PUSCH on at least one serving cell is cancelled, the UE may cancel the (repetition of the) PUSCHs transmission on all other intra-band serving cell(s). The cancellation of the (repetition of the) PUSCH transmission on a the set of intra-band serving cell(s) includes all symbols from the earliest symbol that is overlapping with the first cancelled symbol of the PUSCH on the serving cell for which the DCI format 2\_4 is applicable to.] | 6-23, 11-7 (TBD) | Yes | N/A |  | [Per band] | [N/A] | [N/A] | TBD | FFS: Whether to add this FG and the content for each column if added | Optional with capability signaling |

* **Components of FG11-7/7a**
	+ **Component 1**
		- **Description with brackets is kept: [5], [8], [9], [13], [14], [15], [16]**
			* **Clarify whether to change “[on the same CC as PUSCH or SRS]” to “on the same DL CC scheduling as PUSCH or SRS”: [9], [17]**
		- **Description with brackets is removed: [7]**
	+ **Component 3**
		- **Clarify whether or not to change the description from “cancelled symbol” to “cancelled resource” of FG 11-7/7a: [11]**
	+ **Component with brackets under component 3**
		- **Component is kept: [5], [8], [16]**
		- **Component is removed: [7], [9], [11], [13], [14], [15], [17]**
* **Reporting type of FG11-7/7a**
	+ **Per UE: [15], [17]**
	+ **Per FS: [5], [9], [16]**
* **xDD/FRx diffentiation for FG11-7/7a**
	+ **No differentiation is needed: [9], [16], [17]**
	+ **Differentiation is needed: [8]**
* **Note for FG11-7/7a**
	+ **Note is kept: [7], [8], [13], [14], [15]**
	+ **Note is removed: [9]**
	+ **FFS: [16]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [5] | * FG 11-7/7a
	+ Remove the brackets for component 1 and 3 and the note column
	+ Per FS
* FG 11-7b
	+ Keep 11-7b as separate UE feature
	+ Confirm the pre-requisites
 |
| [7] | * FG 11-7/7a
	+ The description under component 3) has been captured in the physical specification and our understanding is that it should be followed once UL cancellation is supported. It doesn’t need to be included in the UE capability.
	+ Whether more than one monitoring occasions for DCI format 2\_4 per slot is applied depends on the FG 3-5 or FG 3-5a or FG 3-5b. We don’t see the necessity to add new FG with FG 11-7 as prerequisite for the support of more than one monitoring occasion for DCI format 2-4 per slot. The square bracket should be removed accordingly.
 |
| [8] | * FG 11-7
	+ Remove the brackets of *[For the serving cell, the UE determines the first symbol of the* $T\_{CI}$ *symbols to be the first symbol that is after* $T\_{proc,2}+d$ *from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where* $d$ *is provided by higher layer].*
	+ Remove the brackets of [on the same DL CC as that scheduling PUSCH or SRS]
	+ Support the addition of the following note as proposed by the rapporteur: “More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b” and add the Rel-16 FG-11-2 to this note.
	+ No need for any prerequisite FGs.
	+ TDD/FDD and FR1/FR2 differentiation is needed.
* FG 11-7a
	+ Remove the brackets of *[For the serving cell, the UE determines the first symbol of the* $T\_{CI}$ *symbols to be the first symbol that is after* $T\_{proc,2}+d$ *from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where* $d$ *is provided by higher layer].*
	+ Remove the brackets of [on a different DL CC than that scheduling PUSCH or SRS].
	+ Support the addition of the following note as proposed by the rapporteur: “More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b” and add the Rel-16 FG-11-2 to this note
	+ No need for any prerequisite FGs.
	+ TDD/FDD and FR1/FR2 differentiation is needed.
* FG 11-7b
	+ Keep this FG.
 |
| [9] | * FG 11-7
	+ Remove the last component in brackets
	+ For component 1), change from “[on the same CC as PUSCH or SRS]” to “on the same DL CC scheduling ~~as~~ PUSCH or SRS” as the current text is not correct or clear; with the change, the brackets can be removed
	+ Remove the text in Notes column
	+ Reporting should be per FS
	+ No xDD/FRx differentiation
* FG 11-7a
	+ Remove the last component in brackets
	+ Remove the text in Notes column
	+ Reporting should be per FS
	+ No xDD/FRx differentiation
* FG 11-7b
	+ Fine to add the FG, including suggested pre-requisites
 |
| [10] | * FG 11-7/7a
	+ Text in brackets can be removed
* FG 11-7b
	+ OK with either keeping or removing
 |
| [11] | * FG 11-7/7a
	+ In Component 3, “cancelled symbol” needs to change to “cancelled resource”
	+ Statements with bracket can be removed. It is not necessary to specify UE behavior in UE feature list.
* FG 11-7b
	+ Fine to add this FG
 |
| [12] | In RAN1 100b e-meeting, UL cancellation based on physical priority is agreed as shown below[4], so it is suggested to add this new procedure in UE feature.

|  |
| --- |
| Agreement:* If both UL CI and intra-UE priority indicator are configured for a given UE, support a new RRC parameter to configure Behavior #1
	+ Behaviour #1: UL CI is only applicable to the UL transmissions indicated/configured as low priority level
* When the RRC parameter is not provided to the UE, behaviour #2 is used
	+ Behaviour #2: UL CI is applicable to UL transmission irrespective of its priority level
* Note: the RRC signaling details will be decided by RAN2
 |

***Proposal 1: Add 11-7c to support UL cancellation based on physical priority with the following components:******Component 1: Support UL cancellation based on physical priority******Component 2: Support enable or disable UL cancellation based on physical priority*** |
| [13] | * FG 11-7/7a
	+ We are ok with the clarification of Component 1.
	+ Keep the note “More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b”. Agree with some companies that it can depend on Rel-15 UE capability, if UE report the support of FG 3-5/FG 3-5a/FG 3-5b, then it means that it can support more than one monitoring occasion within 1 slot. However, I guess the concern from companies is that if we don't say anything here, it may mean if a UE wants to support FG 11-7 simultaneously it needs to support FG 3-5/FG3-5a/FG 3-5b, even it only intends to support one monitoring occasion per slot. Therefore, instead of adding a new FG the note is sufficient.
	+ The timeline condition is already captured in the spec. It can be deleted here. The similar view to FG 11-7a.
* FG 11-7b
	+ FG11-7b should be kept as separate UE capability since behavior of cancellation itself is complicated especially canceling PUSCHs more than one carrier. And the content for each column should be kept too.
 |
| [14] | * Following updates are proposed.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11-7 | UL cancelation scheme for self-carrier | 1. Supports group common DCI (i.e. DCI format 2\_4) for cancelation indication ~~[~~on the same DL CC as that scheduling PUSCH or SRS~~]~~
2. UL cancelation for PUSCH
* Cancellation is applied to each PUSCH repetition individually in case of PUSCH repetitions
1. UL cancelation for SRS symbols that overlap with the cancelled symbols

~~[For the serving cell, the UE determines the first symbol of the~~ $T\_{CI}$ ~~symbols to be the first symbol that is after~~ $T\_{proc,2}+d$ ~~from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where~~ $d$ ~~is provided by higher layer.]~~  |  | Yes | N/A |  | [Per UE]FFS: FS | [No] | [No] | [N/A]  | ~~[~~More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b or FG 11-2~~]~~  | Optional with capability signalling |
| 11-7a | UL cancelation scheme for cross-carrier | 1. Supports group common DCI (i.e. DCI format 2\_4) for cancelation indication ~~[~~on a different DL CC than that scheduling PUSCH or SRS~~]~~
2. UL cancelation for PUSCH
* Cancellation is applied to each PUSCH repetition individually in case of PUSCH repetitions
1. UL cancelation for SRS symbols that overlap with the cancelled symbols

~~[For the serving cell, the UE determines the first symbol of the~~ $T\_{CI}$ ~~symbols to be the first symbol that is after~~ $T\_{proc,2}+d$ ~~from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where~~ $d$ ~~is provided by higher layer.]~~  |  | Yes | N/A |  | [Per UE]FFS: FS | [No] | [No] | [N/A]  | ~~[~~More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b or FG 11-2~~]~~  | Optional with capability signalling |
| ~~[~~11-7b~~]~~ | [Independent cancellation of the overlapping PUSCHs in an intra-band UL CA] | ~~[~~For a UE indicating the capability of pa-PhaseDiscontinuityImpacts, and if the PUSCH on at least one serving cell is cancelled, the UE ~~may~~ cancels the (repetition of the) PUSCHs transmission on all other intra-band serving cell(s). The cancellation of the (repetition of the) PUSCH transmission on a the set of intra-band serving cell(s) includes all symbols from the earliest symbol that is overlapping with the first cancelled symbol of the PUSCH on the serving cell for which the DCI format 2\_4 is applicable to.~~]~~ | 6-23, 11-7 ~~(TBD)~~ | Yes | N/A |  | [Per band] | [N/A] | [N/A] | TBD | ~~FFS: Whether to add this FG and the content for each column if added~~ | Optional with capability signaling |

* On the handling of CBG-based transmission, there is the same issue on PUSCH cancelation as in intra-UE prioritization. Similarly, we propose:

**Proposal 8: Introduce a FG (e.g. 11-7c) that a UE is not expected to be scheduled with a CBG-based HARQ retransmission that does not include the full TB if the initial HARQ transmission was cancelled in case of inter-UE cancelation.** |
| [15] | * FG 11-7/7a
	+ The brackets for “[on the same DL CC as that scheduling PUSCH or SRS]” and “[on a different DL CC than that scheduling PUSCH or SRS]” can be removed based on the following agreement at RAN1#100bis-e [1], while we prefer not to introduce separate capabilities for the cross-carrier case.

**Agreements:*** Following FGs are included in UE features list for URLLC.
	+ 11-7 UL cancelation scheme for self-carrier
	+ 11-7b UL cancelation scheme for cross-carrier
	+ [11-7a Independent cancellation of the overlapping PUSCHs in an intra-band UL CA]
	+ We do not see the necessity of the component with the brackets related to the processing time. It is described in TS38.213 11.2A already [4]. UE should follow the timeline once it support UL cancelation indication.
	+ The capability on this FG 11-7/7a should be reported in the granularity of per UE
	+ Regarding the note column, remove the brackets for “more than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b”
* FG 11-7b
	+ We do not think this separate FG is necessary. UE reporting FG 11-7 and FG 6-23 can support the feature of FG 11-7b without a separate UE capability.
 |
| [16] | * FG 11-7/7a
	+ Remove the brackets for component 1 and 3
	+ Signaling type is FS
	+ No TDD/FDD or FR1/FR2 differentiation is needed.
	+ The text in brackets under the Note column needs more discussion.
* FG 11-7b
	+ Keep the FG
	+ Signaling is per band
	+ No TDD/FDD or FR1/FR2 differentiation is needed.
* Following additional FGs are proposed

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11-7b | More than one monitoring occasion for DCI 2\_4 per slot on same CC | Monitoring occasions per slot for DCI 2\_4 reception on the same CC as PUSCH or SRSSupported combinations of (X, Y), where X is the minimum gap between monitoring occasions measured from beginning to beginning of the monitoring occasions, including across slots, and Y is the duration of the monitoring occasion, with both X and Y in units of symbols | 11-7 | Yes | N/A |  | FS | N/A | N/A |  | Candidate value set: (X, Y) = {(7, 3),(7, 3) and (4, 3), (7, 3) and (4,3) and (2,2)} | Optional with capability signaling |
| 11-7c | More than one monitoring occasion for DCI 2\_4 per slot on another CC | Monitoring occasions per slot for DCI 2\_4 reception on a different CC as PUSCH or SRSSupported combinations of (X, Y), where X is the minimum gap between monitoring occasions measured from beginning to beginning of the monitoring occasions, including across slots, and Y is the duration of the monitoring occasion, with both X and Y in units of symbols | 11-7a | Yes | N/A |  | FS | N/A | N/A |  | Candidate value set: (X, Y) = {(7, 3),(7, 3) and (4, 3), (7, 3) and (4,3) and (2,2)} | Optional with capability signaling |

 |
| [17] | * FG 11-7/7a
	+ The changes the component 1 (i.e. on the/a same/different DL CC as that scheduling PUSCH or SRS) are fine, but then strictly speaking the components are no longer about ‘self-‘ and ‘cross-carrier’ differentiation anymore. Maybe the name would need to be changed accordingly, something like ‘UL scheduling and UL cancelation from the same serving cell’ and ‘UL scheduling and UL cancelation from different serving cells’
	+ Component 3: text in square brackets can be removed, no need to specify the feature behavior here. Per UE, no xDD/FRy differentiation
* FG 11-7b
	+ Given that there is a strong willingness from chipset vendors to keep this FG we can accept it as a compromise.
 |

Based on above, following FL proposals are made.

**FL proposal 6:**

* **Text within brackt in Component 1 is kept for FG11-7**
* **Text within brackt below Component 3 is removed for FG11-7**
* **Type of FG11-7/7a is Per FS**
* **The bracket is removed from Note for FG11-7/7a**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. NR\_L1enh\_URLLC | 11-7 | UL cancelation scheme for self-carrier | 1. Supports group common DCI (i.e. DCI format 2\_4) for cancelation indication on the same DL CC as that scheduling PUSCH or SRS
2. UL cancelation for PUSCH
* Cancellation is applied to each PUSCH repetition individually in case of PUSCH repetitions
1. UL cancelation for SRS symbols that overlap with the cancelled symbols
 |  | Yes | N/A |  | Per FS | N/A | N/A | N/A  | More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-7a | UL cancelation scheme for cross-carrier | 1. Supports group common DCI (i.e. DCI format 2\_4) for cancelation indication on a different DL CC than that scheduling PUSCH or SRS
2. UL cancelation for PUSCH
* Cancellation is applied to each PUSCH repetition individually in case of PUSCH repetitions
1. UL cancelation for SRS symbols that overlap with the cancelled symbols
 |  | Yes | N/A |  | Per FS | N/A | N/A | N/A | More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Nokia/NSB

|  |  |
| --- | --- |
| Company | Comment |
| Qualcomm | Support the FL proposal in general. However, we prefer to discuss the notes before removing the brackets including the possibility of adding new FGs. |
| Intel | We support FL proposal 6 in general, **except** that we are still not convinced that support of multiple MOs for DCI format 2\_4 in a slot should be subject to support of 3-5, 3-5a, 3-5b. Those FGs are primarily considering reception of unicast scheduling DCI formats while DCI 2\_4 has been designed with monitoring configurations such that PDCCH reception associated with UL CI monitoring is extremely lightweight. On the other hand, especially for SCS of 15 kHz, it would be quite important to support sub-slot monitoring of DCI format 2\_4. Thus, we propose to delete the text in the Notes. |
| Nokia, NSB | The changes the component 1 (i.e. on the/a same/different DL CC as that scheduling PUSCH or SRS) are fine, but then strictly speaking the components are no longer about ‘self-‘ and ‘cross-carrier’ differentiation anymore. Maybe the name would need to be changed accordingly, something like ‘UL scheduling and UL cancelation from the same serving cell’ and ‘UL scheduling and UL cancelation from different serving cells’Type should be per UE, no xDD/FRx differentiation |
| Moderator (NTT DOCOMO) | We need to check views from other companies on following points.* Necessity of note
* Component 1 description update
* Type (Per UE without differentiation or Per FS or any other compromised way)
 |
| Apple | Support Proposa 6, except that 11-2/2a should be added in the note as well. |
| Qualcomm2 | Agree with Apple that 11-2/2a needs to be added. |
| ZTE | We prefer to remove the note and the reporting type is per UE.  |

Based on discussion in GTW session, following agreements were made.

**Agreements:**

* **Text within bracket in Component 1 is kept for FG11-7**
* **Text within bracket below Component 3 is removed for FG11-7**
* **FFS: Type of FG11-7/7a is Per FS**
* **FFS: The bracket is removed from Note for FG11-7/7a, and add 11-2/2a in the note**

### **Updated FL proposal 6:**

* **Type of FG11-7/7a is Per FS**
* **The bracket is removed from Note for FG11-7/7a**

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals:

|  |  |
| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | Based on the feedbacks so far, * Support per UE (without xDD/FRx differentiation): Nokia, NSB, ZTE
* Support per FS: Qualcomm, Apple, Intel

So, clear reason for per FS or compromised proposal (e.g., per UE with FRx differentiation) is necessary. |
| Nokia, NSB | Type should be per UE unless a clear reason is provided for per FS. |
| Apple | The benefit of this feature depends on the band, and there may not be strong use case to support the feature in FR2. These two FGs are also very demanding in UE processing, considering that this can be a UE with processing capability 1 but required to be able to cancel according to processing capability 2. Therefore, it is important to take into account the BC information for dimensioning purpose. |
| Huawei, HiSilicon | Fine  |

## 2.7 FG11-9/9a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-9 | Multiple active configured grant configurations for a BWP of a serving cell | 1. Supports up to 12 configured/active configured grant configurations in a BWP of a serving cell.

• Separate RRC parameters for different configured grant configurations• Separate activation for different configured grant Type 2 configurations• Separate release for different configured grant Type 2 configurations1. [Supported maximum number of configured/active configured grant configurations in a BWP of a serving cell]
2. [Supported maximum number of configured/active configured grant configurations across all serving cells]
 | TBDFFS: 5-19 or 5-20 | Yes | N/A |  | [Per UE]FFS: FSPC | [No] | [No] | [N/A]  |  | Optional with capability signallingFFS: Candidate value for component 2: {1, 2, …, 12}FFS: Candidate value for component 3: {2, …, [32]} |
| 11. NR\_L1enh\_URLLC | 11-9a | Joint release in a DCI for two or more configured grant Type 2 configurations for a given BWP of a serving cell | 1. M<=4 bits indication in the Release DCI is used for indicating which CG configuration(s) is/are released, where the association between each state indicated by the indication and the CG configuration(s) is

• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple CG configurations to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the CG configuration index indicated by the indication | 11-9 (TBD) | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  | FFS: A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1). A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2). | Optional with capability signalling |

* **Components of FG11-9**
	+ **Component 2/3**
		- **Components are kept: [5], [7], [8], [9], [10], [12], [13], [15], [16], [17]**
			* **Candidate values for component 2:**
				+ **{2, …, 12}: [15]**
				+ **{1, 2, 4, 8, 12}: [6]**
			* **Candidate values for component 3:**
				+ **{2, …, [32]}: [10]**
				+ **{2, …, 24}: [6], [16]**
				+ **FFS: [15]**
		- **Components are removed: [6]**
* **Prerequisite feature groups for FG11-9**
	+ **“FG 5-19 or FG 5-20” is kept: [5], [9], [13]**
* **Prerequisite feature groups for FG11-9a**
	+ **FG 11-9 is kept: [5], [9], [13]**
* **Reporting type of FG11-9**
	+ **Per UE: [9], [13], [15], [17]**
	+ **Per band: [16]**
* **Reporting type of FG11-9a**
	+ **Per UE: [5], [9], [15], [17]**
	+ **Per band: [16]**
* **xDD/FRx diffentiation for FG11-9**
	+ **No differentiation is needed: [9], [15], [16], [17]**
* **xDD/FRx diffentiation for FG11-9a**
	+ **No differentiation is needed: [9], [15], [16], [17]**
* **Note for FG11-9**
	+ **Add a note to indicate that number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15.: [8]**
	+ **Add a note for component 3: “Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values.”: [16]**
* **Note for FG11-9a**
	+ **Note is removed: [5], [9], [13], [15], [16]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [5] | * FG 11-9
	+ Keep component 2 and 3
	+ Confirm the pre-requisites
* FG 11-9a
	+ Confirm the pre-requisites
	+ Remove FFS bullet from the note column
	+ Per UE
 |
| [6] | * FG 11-9
	+ Preferably component 2) and 3) of FG 11-9 are not introduced.
	+ If component 2) of FG 11-9 is introduced, the supported maximum number of configured grant configurations in a BWP of a serving cell is selected from {1, 2, 4, 8, 12}.
	+ If Component 3) of FG 11-9 is introduced, component 3) is updated to: “3) Supported maximum number of configured grant configurations across all serving cells in a cell group is 24.”
 |
| [7] | Following updates are proposed.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11-9 | Multiple active configured grant configurations for a BWP of a serving cell | 1. Supports up to 12 configured/active configured grant configurations in a BWP of a serving cell.

• Separate RRC parameters for different configured grant configurations• Separate activation for different configured grant Type 2 configurations• Separate release for different configured grant Type 2 configurations1. ~~[~~Supported maximum number of configured/active configured grant configurations in a BWP of a serving cell~~]~~
2. ~~[~~Supported maximum number of configured/active configured grant configurations across all serving cells in a cell group~~]~~
 | TBDFFS: 5-19 or 5-20 | Yes | N/A |  | [Per UE]FFS: FSPC | [No] | [No] | [N/A]  |  | Optional with capability signallingFFS: Candidate value for component 2: {1, 2, …, 12}FFS: Candidate value for component 3: {2, …, [32]} |

 |
| [8] | * FG 11-9
	+ Remove the brackets from component 2) and component 3).

“*[2) Supported maximum number of configured/active configured grant configurations in a BWP of a serving cell]*”“*[3) Supported maximum number of configured/active configured grant configurations across all serving cells]*”* + Add a note to indicate that number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15.
 |
| [9] | * FG 11-9
	+ Keep components 2) and 3), but should be “configured”
	+ Pre-requisites should be FG 5-19 or 5-20
	+ Per UE
	+ No xDD/FRx differentiation
* FG 11-9a
	+ Pre-requisite should be FG 11-9
	+ Per UE
	+ No xDD/FRx differentiation
	+ Text in Notes column should be removed
 |
| [10] | * FG 11-9
	+ Keep component 2, 3. OK to merge component 1 and 2.
	+ Support 32 for component 3.
 |
| [11] | * FG 11-9
	+ The text in ‘Note’ column should be removed
 |
| [12] | It is necessary to report the maximum number of active configured grant configurations for a serving cell and a MAC entity, so it is suggest to remove bracket of component 2 and 3.***Proposal 2: Support to remove bracket of component 2 and 3 in 11-9.*** |
| [13] | * FG 11-9
	+ We would prefer to keep component 2 and component 3 and also the candidate values for this two components. UE complexity would be increased with the increase of the number of configured grant configurations. Therefore, UE should report the maximum number of configured grant configurations it can support within a BWP. And we are ok with the change of “active” to “configured/active”.
	+ We are ok to set 5-19 or 5-20 as the prerequisite feature group for FG 11-9.
	+ We are ok to set the type as per UE.
* FG 11-9a
	+ We are OK to set FG 11-9 as the prerequisite feature group for FG 11-9a.
	+ Ok to remove the FFS in the note column, though since we have FG 11-10 and FG 11-11 as separate UE capability, it seems no need to mandate supporting both.
 |
| [15] | * FG 11-9
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
	+ We are OK to remove the brackets on components 2 and 3. Candidate value for component 2 should be {2, 3, …, 12} (remove “1” since it is supported by FGs 5-19 and 5-20) and that for component 3 needs further discussion.
* FG 11-9a
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
	+ We are OK to remove the FFS, i.e., a UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1). A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2)
 |
| [16] | * FG 11-9
	+ Keep component 2 and 3
	+ The signaling type is per band
	+ No TDD/FDD or FR1/FR2 differentiation is needed.
	+ The upper bound for the value set of component 3 is 24.
	+ Add the following note for component 3: “Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values.”
* FG 11-9a
	+ The signaling type is per band
	+ No TDD/FDD or FR1/FR2 differentiation is needed.
	+ Remove the FFS note from the note column.
 |
| [17] | * FG 11-9
	+ OK to confirm components 2 and 3.
	+ We would prefer to clarify that the components in this FG refer to active configurations, as otherwise it is unclear what is the meaning of the components.
	+ Per UE, no xDD/FRy differentiation
* FG 11-9a
	+ Per UE, no xDD/FRy differentiation.
 |

Based on above, following FL proposals are made.

**FL proposal 7:**

* **Component 2 and 3 are kept for FG11-9**
	+ **Candidate values for component 2: {1, 2, 4, 8, 12}**
	+ **Candidate values for component 3: {2, …, 24}**
* **One of {5-19, 5-20} is a prerequisite feature group for FG11-9**
* **FG 11-9 is a prerequisite feature group for FG11-9a**
* **Type of FG11-9/9a is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **Add following notes for FG11-9**
	+ **The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15**
	+ **For component 3: Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values**
* **Remove note for FG11-9a**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. NR\_L1enh\_URLLC | 11-9 | Multiple active configured grant configurations for a BWP of a serving cell | 1. Supports up to 12 configured/active configured grant configurations in a BWP of a serving cell.

• Separate RRC parameters for different configured grant configurations• Separate activation for different configured grant Type 2 configurations• Separate release for different configured grant Type 2 configurations1. Supported maximum number of configured/active configured grant configurations in a BWP of a serving cell
2. Supported maximum number of configured/active configured grant configurations across all serving cells
 | One of {5-19, 5-20 | Yes | N/A |  | Per UE | No | No | N/A  | Candidate values for component 2: {1, 2, 4, 8, 12}Candidate values for component 3: {2, …, 24}The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15For component 3: Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-9a | Joint release in a DCI for two or more configured grant Type 2 configurations for a given BWP of a serving cell | 1. M<=4 bits indication in the Release DCI is used for indicating which CG configuration(s) is/are released, where the association between each state indicated by the indication and the CG configuration(s) is

• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple CG configurations to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the CG configuration index indicated by the indication | 11-9 | Yes | N/A |  | Per UE | No | No | N/A  |  | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm (only due to the type of signaling.)

|  |  |
| --- | --- |
| Company | Comment |
| Qualcomm | For 11-9:* We propose to change the signaling type to per band.
* The note “The number of PUSCHs for different TBs …” needs to be clarified. It is not clear to us why it is included; however, we are definitely open to discuss the need.

For 11-9a:* We propose to change the signaling type to per band.
 |
| Intel | We support the FL proposal 7 in general. However, the interpretation of “configured/active” still needs to be clarified – should it be interpreted as “configured” for Type 1 CG PUSCH and “activated” for Type 2 CG PUSCH? |
| Nokia, NSB | * OK to confirm components 2 and 3.
* Agree with Intel on the need to differentiate Type 1 (configured) and Type 2 CG (activated) for components 2 and 3
* Per UE, no xDD/FRy differentiation
 |
| Moderator (NTT DOCOMO) | The situation is only one company proposes to change the type to per band.Therefore, my suggestion is to agree on current proposal (Per UE without differentiation). Or can e.g., per UE with FR1/FR2 differentiation be possible compromise?Further clarification on interpretation of “configured/active” in component 2/3 of 11-9 and note “the number of PUSCHs for different TBs…” for 11-9 seems necessary. |
| Apple | For 11-9, we also wonder why the note “The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15” is included.Intel seems to have a good point on clarifying “configured/active” due to mix of Type 1 and Type 2 CG. To avoid confusion, should we simply say “configured”? As there is no restriction on how many Type 2 CG can be activated, all the configured Type 2 CG can be active.We prefer it to be per band but we can further discuss. |
| Qualcomm2 | As for the type, the number of CG configurations that can be activated has an impact on UE’s MAC operations (considering the LCP prioritization rules too introduced in RAN2.) This should be considered when the UE supports ULCA. Hence, although it is not the best option managing UE’s complexity, we propose to set the type to per band. Also, a question for the companies supporting per UE signaling; why should the UE report the same capability in FR1 and FR2 (specifically, why should the UE report the same number of configurations in both FRs)?  |
| ZTE | Agree with Apple that just saying ‘configured’ should be sufficient.  |

Based on discussion in GTW session, following agreements were made.

**Agreements:**

* **FFS: Component 2 and 3 are kept for FG11-9**
	+ **Candidate values for component 2: {1, 2, 4, 8, 12}**
	+ **Candidate values for component 3: {2, …, 24}**
	+ **“configured/active” in component 2/3 is changed to “configured”**
* **One of {5-19, 5-20} is a prerequisite feature group for FG11-9**
* **FG 11-9 is a prerequisite feature group for FG11-9a**
* **FFS: Type of FG11-9/9a is Per UE or per band**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FFS: Add following notes for FG11-9**
	+ **The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15**
	+ **For component 3: Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values**
* **Remove note for FG11-9a**

### **Updated FL proposal 7:**

* **Component 2 and 3 are kept for FG11-9**
	+ **Candidate values for component 2: {1, 2, 4, 8, 12}**
	+ **Candidate values for component 3: {2, …, 24}**
	+ **“configured/active” in component 2/3 is changed to “configured”**
* **Type of FG11-9/9a is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “Yes”**
* **Add following notes for FG11-9**
	+ **The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15**
	+ **For component 3: Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values**

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals:

|  |  |
| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | Based on the feedbacks so far, * Support per UE (without xDD/FRx differentiation): Nokia, NSB, Intel
* Support per band: Qualcomm, Apple

So, can we have per UE with FR1/FR2 differentiation as compromise? |
| Apple | It is not clear why we need the following note:” **The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15**” |
| Huawei, HiSilicon | 1. Change “24” to “32” in the candidate values for component 3. Since according to RAN2 agreements, 32 is supported.
2. The note “**The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15**” can be removed. Since if CG is based on repetition type B, can determined based on FG11-5, and if it is based on repetition type A, can depend on FG 11-6 also.
3. As to the reporting type, if UE has concern because of component 2 and component 3, probably ok for us to add a note in the note column to say these two components are reported separately for different processing capability.
 |
| Nokia, NSB | On the component 2 / 3 description – as we pointed out earlier and aligned with the related components for SPS (there we have ‘active’), so the intention of this should also be reflected here. As pointed out by Intel earlier as we got for CG Type 1 & Type 2, there is a need to differentiate here to get the same intention: configured for Type 1 (as when configured, the UE regards the grant automatically as ‘active’) and for Type 2 after the activation. Therefore, we suggest the component 2 description to: 1. Supported maximum number of simultaneously configured~~/active~~ Type 1 configured grant configurations and activated Type 2 configured grant configurations in a BWP of a serving cell
2. Supported maximum number of simultaneously configured~~/active~~ Type 1 configured grant configurations and activated Type 2 configured grant configurations across all serving cells

Candidate values for component 3: Overall, as far as we have understood it, from RAN2 perspective there are up to 32 CGs supported for a serving cell. Therefore, we think the value range of the reported capability should be aligned here – at least to be future proof for high end UEs here. So the suggestion is to change the maximum value from 24 to 32. * + **Candidate values for component 3: {2, …, ~~24~~ 32}**
 |

## 2.8 FG11-10

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between Ues (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-10  | Type 2 configured grant release by DCI format 0\_1  | 1. Support of type 2 configured grant release by DCI format 0\_1
 | 5-20 | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received | [A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2).] | Optional with capability signalling |

* **Prerequisite feature groups for FG11-10**
	+ **5-20 is kept: [5], [9], [13]**
* **Reporting type of FG11-10**
	+ **Per UE: [5], [9], [15], [17]**
	+ **Per band: [16]**
* **xDD/FRx diffentiation for FG11-10**
	+ **No differentiation is needed: [5], [9], [15], [16], [17]**
* **Note for FG11-10**
	+ **Clarify hether or not to keep the note**
		- **The note is kept: [17]**
		- **The note is removed: [5], [9], [10], [15], [16]**
* **Capability interpretation**
	+ **Clarify whether or not to remove the FFS**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [5] | * Pre-requisite should be FG 5-20
* Per UE
* No xDD/FRx differentiation
* Text in Notes column should be removed
 |
| [9] | * Pre-requisite should be FG 5-20
* Per UE
* No xDD/FRx differentiation
* Text in Notes column should be removed
 |
| [10] | Remove [A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2).] |
| [13] | We are OK to set FG 5-20 as the prerequisite feature group for FG 11-10. |
| [15] | * The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
* We don’t think the sentence in the bracket in the Note column is necessary
 |
| [16] | * Signaling type is per band.
* No need for TDD/FDD or FR1/FR2 differentiation or interpretation.
* The note in bracket should be removed.
 |
| [17] | Per UE, no xDD/Fry differentiation. Ok to remove brackets from the notes.  |

Based on above, following FL proposals are made.

**FL proposal 8:**

* **Type of FG11-10 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FG5-20 is a prerequisite feature group for FG11-10**
* **The capability interpretation is from the perspective of a carrier on which the release DCI is received**
* **Text is removed from the Note for FG11-10**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. NR\_L1enh\_URLLC | 11-10  | Type 2 configured grant release by DCI format 0\_1  | 1. Support of type 2 configured grant release by DCI format 0\_1
 | 5-20 | Yes | N/A |  | Per UE | No | No | N/A The capability interpretation is from the perspective of a carrier on which the release DCI is received |  | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm (due to the signaling type only)

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon  | 1. The motivation to keep the note “The capability interpretation is from the perspective of a carrier on which the release DCI is received” should be clarified.
 |
| Qualcomm | We propose to change the type to per band |
| Intel | Similar to Huawei, we are not sure why we need the Note “The capability interpretation is from the perspective of a carrier on which the release DCI is received”. Otherwise, we support the proposal. |
| Nokia, NSB | We support FL proposal in general, but the reason for the capability note is not clear to us (as pointed out by HW & Intel). Also slightly unclear to us why the note on the relation of 11-10 and 11-11 is to be removed.  |
| Moderator (NTT DOCOMO) | The situation is only one company proposes to change the type to per band.Therefore, my suggestion is to agree on current proposal (Per UE without differentiation). Or can e.g., per UE with FR1/FR2 differentiation be possible compromise?Regarding the note on the capability interpretation as well as removed note, further clarification from proponent is necessary. |
| Apple | Support Proposal 8 except for the same commnent on the note as other companies. |
| ZTE | Support the proposal with same view on the note. |

Based on discussion in GTW session, following agreements were made.

**Agreements:**

* **FFS: Type of FG11-10 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FG5-20 is a prerequisite feature group for FG11-10**
* **FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received**
* **FFS: Text is removed from the Note for FG11-10**

### **Updated FL proposal 8:**

* **Type of FG11-10 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **Text is kept in the Note for FG11-10**

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals:

|  |  |
| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | There is clear majority support on “Per UE without xDD/FRx differentiation”. I suggest to agree on it. Or can we have FR1/FR2 differentiation as compromise? |
| Nokia, NSB | Support FL proposal. |
| Apple | Support |
| Huawei, HiSilicon | Support  |

## 2.9 FG11-11

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-11  | Type 2 configured grant release by DCI format 0\_2 | 1. Support of type 2 configured grant release by DCI format 0\_2
 | 5-20, 11-1 | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received | [A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1).] | Optional with capability signalling |

* **Prerequisite feature groups for FG11-11**
	+ **5-20 and 11-1 are kept: [5], [9]**
* **Reporting type of FG11-11**
	+ **Per UE: [5], [9], [15], [17]**
	+ **Per band: [16]**
* **xDD/FRx diffentiation for FG11-11**
	+ **No differentiation is needed: [5], [9], [15], [16], [17]**
* **Note for FG11-11**
	+ **Clarify hether or not to keep the note**
		- **The note is kept: [17]**
		- **The note is removed: [5], [9], [10], [15], [16]**
* **Capability interpretation**
	+ **Clarify whether or not to remove the FFS**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [5] | * Pre-requisites should be FG 5-20 and 11-1
* Per UE
* No xDD/FRx differentiation
* Text in Notes column should be removed
 |
| [9] | * Pre-requisites should be FG 5-20 and 11-1
* Per UE
* No xDD/FRx differentiation
* Text in Notes column should be removed
 |
| [10] | Remove [A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1).] |
| [15] | * The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
* We don’t think the sentence in the bracket in the Note column is necessary
 |
| [16] | * Signaling type is per band.
* No need for TDD/FDD or FR1/FR2 differentiation or interpretation.
* The note in bracket should be removed.
 |
| [17] | Per UE, no xDD/Fry differentiation. Ok to remove brackets from the notes.  |

Based on above, following FL proposals are made.

**FL proposal 9:**

* **Type of FG11-11 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FG5-20 and 5-11 are prerequisite feature groups for FG11-11**
* **The capability interpretation is from the perspective of a carrier on which the release DCI is received**
* **Text is removed from the Note for FG11-11**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. NR\_L1enh\_URLLC | 11-11  | Type 2 configured grant release by DCI format 0\_2 | 1. Support of type 2 configured grant release by DCI format 0\_2
 | 5-20, 11-1 | Yes | N/A |  | Per UE | No | No | N/A The capability interpretation is from the perspective of a carrier on which the release DCI is received |  | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm (due to the signaling type)

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon  | The motivation to keep the note “The capability interpretation is from the perspective of a carrier on which the release DCI is received” should be clarified.  |
| Qualcomm | We propose to change the signaling type to per band. |
| Intel | Similar to Huawei, we are not sure why we need the Note “The capability interpretation is from the perspective of a carrier on which the release DCI is received”. Otherwise, we support the proposal. |
| Nokia, NSB | We support FL proposal in general, but the reason for the capability note is not clear to us (as pointed out by HW & Intel). Also slightly unclear to us why the note on the relation of 11-10 and 11-11 is to be removed. |
| Moderator (NTT DOCOMO) | The situation is only one company proposes to change the type to per band.Therefore, my suggestion is to agree on current proposal (Per UE without differentiation). Or can e.g., per UE with FR1/FR2 differentiation be possible compromise?Regarding the note on the capability interpretation as well as removed note, further clarification from proponent is necessary. |
| Apple | Support Proposal 9 except for the same commnent on the note as other companies. |
| Qualcomm2 | The type of signaling depends on the type for FG 11-1. We prefer both to be per band. |
| ZTE | Support the proposal with same view on the note. |

Based on discussion in GTW session, following agreements were made.

**Agreements:**

* **FFS: Type of FG11-11 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FG5-20 and 5-11 are prerequisite feature groups for FG11-11**
* **FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received**
* **FFS: Text is removed from the Note for FG11-11**

### **Updated FL proposal 9:**

* **Type of FG11-11 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **Text is kept in the Note for FG11-11**

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals:

|  |  |
| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | There is clear majority support on “Per UE without xDD/FRx differentiation”. I suggest to agree on it. Or can we have FR1/FR2 differentiation as compromise? |
| Nokia, NSB | Support FL proposal |
| Apple | Support |
| Huawei, HiSilicon | Support |

1. Discussion on UE features for IIoT

## 3.1 FG12-1/[1a]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 12. NR\_IIOT | 12-1 | UL intra-UE multiplexing/prioritization of overlapping channel/signals with two priority levels in physical layer | Support intra-UE multiplexing/prioritization of overlapping PUCCH/PUCCH and PUCCH/PUSCH with two priority levels in physical layer (PHY)1. [Configuration of PHY priority level for CG PUSCH and SR, and dynamic indication of priority level for dynamic PUSCH with a single DCI format]
2. Multiplexing/prioritization between UL channels/signals with the same PHY priority level
3. Prioritization between UL channels/signals with different PHY priority levels
4. Additional number of symbols (d1) needed beyond the PUSCH preparation time for cancelling a low priority UL transmission.
5. Additional number of symbols (d2) needed beyond the PUSCH preparation time for scheduling a high priority UL transmission that cancels a low priority UL transmission
 | [11-4] | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] | Candidate value set for component 4: {0, 1, 2}Candidate value set for component 5: {0, 1, 2}[A UE supporting this feature shall also support the LCP restriction based on DCI priority indication ([*lch-ToGrantPriorityRestriction-r16*]) and intra-UE prioritization in MAC ([*lch-PriorityBasedPrioritization-r16*]).] The relationship between this feature and the feature of up to two HARQ-ACK codebooks of 11-4 and 11-4xshould be further discussed. | Optional with capability signaling |
| 12. NR\_IIOT | [12-1a] | [UL priority indication in DCI with mixed DCI formats] | [UL priority indication in DCI with DCI format 0\_1 and 0\_2] | 12-1 and 11-1TBD | Yes | N/A | FFS | Per UE | [No] | [No] | [N/A]  |  | Optional with capability signalling |

* **Components of FG12-1**
	+ **Component 1 is kept: [11], [12], [14], [17]**
	+ **Component 1 is removed: [15]**
	+ **FFS: [16]**
* **Prerequisite feature groups for FG12-1**
	+ **FG 11-4 is kept: [11], [17]**
	+ **FG 11-4 is removed: [9]**
* **Reporting type of FG12-1**
	+ **Per UE: [6], [13], [15], [17]**
	+ **Per FS: [9]**
	+ **Per FSPC: [14], [16]**
* **xDD/FRx diffentiation for FG12-1**
	+ **No differentiation is needed: [6], [9], [11], [15], [16], [17]**
	+ **Differentiation is needed: [8]**
* **Note for FG12-1**
	+ **Note is kept: [9], [17]**
	+ **Note is removed: [16]**
* **Others**
	+ **Clarify whether or not to move FG 12-1 to the URLLC feature list: [12]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [4] | ***Proposal 2:*** *FG 12-1a is removed, and priority indication by DL or UL in merged in FG 11-4b.* |
| [5] | * FG 12-1
	+ The relation between PHY intra-UE prioritization (12-1) and MAC intra-UE prioritization [*lch-PriorityBasedPrioritization-r16*] should be discussed, our view
		- PHY intra-UE prioritization (12-1) can be supported by the UE without supporting MAC intra-UE prioritization [*lch-PriorityBasedPrioritization-r16*]
		- PHY intra-UE prioritization (12-1) should be the prerequisite of MAC intra-UE prioritization [*lch-PriorityBasedPrioritization-r16*]
* FG 12-1a
	+ Keep 12-1a as a separate UE feature, and to clarify the understanding of 11-4b as the following
		- If a UE is capable of 12-1a, the UE is expected to follow the explicitly indicated priority (low or high) for PUSCH in the scheduling DCI format of DCI format 0\_1 and DCI format 0\_2
		- If a UE is not capable of 12-1a (but capable of 11-1a), the UE is expected to assume low priority for PUSCH for DCI format 0\_1, and to follow the indicated priority (low or high) for PUSCH in the scheduling DCI format for DCI format 0\_2.
	+ No FR1/FR2 differentiation
	+ No TDD/FDD differentiation
 |
| [6] | * FG 12-1
	+ Set Type to ‘Per UE’.
	+ No need of FDD/TDD differentiation.
	+ No need of FR1/FR2 differentiation.
	+ Set ‘Capability interpretation for mixture of FDD/TDD and/or FR1/FR2’ to ‘N/A’.
* FG 12-1a
	+ If FG [12-1a] and [11-4b] are to be introduced, combine them into one FG [12-1a].
	+ No need of FDD/TDD differentiation.
	+ No need of FR1/FR2 differentiation.
	+ Set ‘Capability interpretation for mixture of FDD/TDD and/or FR1/FR2’ to ‘N/A’.
 |
| [7] | It is our understanding that FG 12-1 includes intra-UE multiplexing/prioritization of all the UL overlapping channels/signals instead of PUCCH/PUCCH and PUCCH/PUSCH only. For a UE supports FG 12-1, the UE should support LCH based prioritization in MAC. In addition, a UE may support FG 12-1 but not support FG 11-4 for example a UE supports UL URLLC service only. |
| [9] | * FG 12-1
	+ It is not necessary for FG 11-4 to be a pre-requisite for FG #12-1.
		- If a UE does not support FG 11-4, but supports FG 12-1, it means that PUCCH with HARQ-ACK is always of low priority, however, PUSCH can still be associated with low and high priorities for handling other overlap scenarios (including dropping of HARQ-ACK in case of overlap with PUSCH instead of multiplexing if PUSCH needs to be protected to satisfy reliability requirements).
	+ In the Note column, modify as: A UE supporting this feature shall also support ~~the LCP restriction based on DCI priority indication ([~~*~~lch-ToGrantPriorityRestriction-r16~~*~~]) and~~ intra-UE prioritization in MAC ([*lch-PriorityBasedPrioritization-r16*]). Technical reason below:
		- The support of LCP restriction based on DCI priority requires support of 12-1 as a pre-requisite, and this dependency is sufficient. A UE reporting support of FG #12-1 should not be mandated to also support DCI indication based LCP restriction.
	+ Reporting should be FS
	+ No xDD/FRx differentiation
* FG 12-1a
	+ Keep the FG with following updates
	+ Update the component description to avoid ambiguities and align with RAN1 agreement: **“Dynamic indication of high or low priority for PUSCH in DCI scheduling the PUSCH** **when configured to monitor both sets of DCI formats 0\_1/1\_1 and 0\_2/1\_2 in a BWP** ~~UL priority indication in DCI with DCI format 0\_1 and 0\_2~~”.
	+ Pre-requisites should be FGs 11-1 and 12-1
	+ No xDD/FRx differentiation
 |
| [10] | * FG 12-1
	+ Keep original sentence as “UL overlapping channels/signals”
 |
| [11] | * FG 12-1
	+ Update the component 1) as: “Configuration of 2-level PHY priority for CG PUSCH and SR, dynamic indication of 2-level PHY priority for dynamic scheduled PUSCH when configured to monitor either set of DCI formats 0\_1/1\_1 or 0\_2/1\_2 in a BWP ”
	+ Fine to remove the bracket on prerequisite “[11-4]”
	+ No need of xDD/FRx differentiation
* FG 12-1a
	+ Fine to keep this FG but need of similar update for consistency to FG description: “dynamic indication of 2-level PHY priority for dynamic scheduled PUSCH when configured to monitor both sets of DCI formats 0\_1/1\_1 and 0\_2/1\_2 in a BWP ”
	+ No need of xDD/FRx differentiation
 |
| [12] | * FG 12-1

***Proposal 3: It is better to move 12-1 to URLLC feature, due to it only focuses on UCI related prioritization.******Proposal 4: Support to remove bracket of component 1 in 12-1.******Proposal 5: Add dynamic indication of priority level for HARQ-ACK for dynamic PDSCH and configuration of PHY priority level for HARQ-ACK for configured grant in 12-1.*** |
| [13] | * FG 12-1
	+ We are ok with FG11-4 as the prerequisite feature group of FG 12-1.
	+ As to the reporting type, we think “per UE” is sufficient, motivation for other UE reporting type should be clarified first.
	+ We prefer the original description on the main bullet, since collision of PUSCH and PUSCH should be included also.
* FG 12-1a
	+ We are fine to keep FG12-1a, though it seems not really necessary to split with DL.
 |
| [14] | Following updates are proposed.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12-1 | UL intra-UE multiplexing/prioritization of overlapping channel/signals with two priority levels for SR and PUSCH in physical layer | Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for SR and PUSCH in physical layer (PHY)1. Configuration of PHY priority level for CG PUSCH and SR, and dynamic indication of priority level for dynamic PUSCH
2. Supports a DCI format (from the formats 0\_1/0\_2) scheduling PUSCH with different priorities when only one of the DCI formats 0\_1 and 0\_2 is configured per BWP
3. Multiplexing/prioritization between UL channels/signals with the same PHY priority level
4. Prioritization between UL channels/signals with different PHY priority levels
5. Additional number of symbols (d1) needed beyond the PUSCH preparation time for cancelling a low priority UL transmission.
6. Additional number of symbols (d2) needed beyond the PUSCH preparation time for scheduling a high priority UL transmission that cancels a low priority UL transmission
 | TBD | Yes | N/A |  | ~~[Per UE]~~Per FSPC | [No] | [No] | [N/A] | [A UE supporting this feature shall also support the LCP restriction based on DCI priority indication ([lch-ToGrantPriorityRestriction-r16]) and intra-UE prioritization in MAC ([lch-PriorityBasedPrioritization-r16]).] ~~The relationship between this feature and the feature of up to two HARQ-ACK codebooks of 11-4x including merging these features should be further discussed.~~Candidate value set for component 4: {0, 1, 2}Candidate value set for component 5: {0, 1, 2} | Optional with capability signaling~~Candidate value set for component 4: {0, 1, 2}~~~~Candidate value set for component 5: {0, 1, 2}~~ |
| ~~[~~12-1a~~]~~ | ~~[UL~~ PUSCH priority indication in DCI with mixed DCI formats~~]~~ | ~~[UL~~ PUSCH priority indication in DCI when both DCI formats 0\_1 and 0\_2 are configured per BWP ~~with mixed DCI formats]~~ | TBD | Yes | N/A | FFS | Per UE | [No] | [No] | [N/A]  |  | Optional with capability signalling |

 |
| [15] | * FG 12-1
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
	+ The sentence in bracket in component 1 should be removed, i.e., irrespective of whether only one of DCI format 0\_1/1\_1 or DCI format 0\_2/1\_2 is configured or both DCI formats are configured in USS, FG 12-1 should be supported.
* FG 12-1a
	+ We are OK to remove the bracket, i.e., keep this FG.
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
 |
| [16] | * FG 12-1
	+ Component 1 is not clear as it does not refer to the PUCCH priority. This component needs more discussion.
	+ The signaling type should be FSPC
	+ Based on the proposed signaling type, there is no need for TDD/FDD or FR1/FR2 differentiation. No need for interpretation either.
	+ The first note about the relation to the MAC based features should be removed.
* FG 12-1a
	+ The type of signaling should be FSPC
	+ Based on the proposed type, there is no need for TDD/FDD, FR1/FR2 differentiation or interpretation.
	+ In the note column, add the following: “For a UE supporting this feature, one DCI format indicates low priority level and one DCI format indicates high priority level.”
* Following additional FG is proposed.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12. NR\_IIOT | 12-1b | Cancellation of configured SRS, PUCCH, PUSCH or PRACH with a DCI scheduling a PDSCH or CSI-RS or a DCI format 2\_0 for SFI | A UE supports the partial cancellation of the SRS or PUCCH or PUSCH or PRACH configured transmission: 1. The UE cancels the configured SRS or PUCCH or PUSCH or PRACH in a set of symbols of a slot due to detection of a DCI format 2\_0 with a slot format value other than 255 *255* that indicates a slot format with a subset of symbols from the set of symbols as downlink or flexible
2. The UE cancels the configured SRS or PUCCH or PUSCH or PRACH in a set of symbols of a slot due to the detection of a DCI format 1\_0, DCI format 1\_1, DCI format 1\_2 or DCI format 0\_1 and DCI format 0\_2 indicating to the UE to receive CSI-RS or PDSCH in a subset of symbols from the set of symbols.

  |  | Yes | N/A |  | FS | N/A | N/A | N/A | Optional with capability signaling.Component-1 is subjected to FG 3-6 |

 |
| [17] | * FG 12-1
	+ The case of CG PUSCH versus DG PUSCH multiplexing/prioritization should be part of this FG as well, and hence we prefer to revert to the previous formulation.
	+ OK to remove brackets from component 1.
	+ OK to remove brackets from the notes related to MAC feature.
	+ 11-4 should be a pre-requisite FG (to resolve the open issue in notes section).
	+ Reporting type can be per UE, no xDD/FRy differentiation.
* FG 12-1a
	+ OK to remove the brackets from the FG name & component.
	+ Reporting type can be per UE, no xDD/FRy differentiation.
 |

Based on above, following FL proposals are made.

**FL proposal 10:**

* **Component 1 is kept for FG12-1**
* **FG11-4 is a prerequisite feature group for FG12-1**
* **Type of FG12-1 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **The bracket is removed from Note for FG12-1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12. NR\_IIOT | 12-1 | UL intra-UE multiplexing/prioritization of overlapping channel/signals with two priority levels in physical layer | Support intra-UE multiplexing/prioritization of overlapping PUCCH/PUCCH and PUCCH/PUSCH with two priority levels in physical layer (PHY)1. Configuration of PHY priority level for CG PUSCH and SR, and dynamic indication of priority level for dynamic PUSCH with a single DCI format
2. Multiplexing/prioritization between UL channels/signals with the same PHY priority level
3. Prioritization between UL channels/signals with different PHY priority levels
4. Additional number of symbols (d1) needed beyond the PUSCH preparation time for cancelling a low priority UL transmission.
5. Additional number of symbols (d2) needed beyond the PUSCH preparation time for scheduling a high priority UL transmission that cancels a low priority UL transmission
 | 11-4 | Yes | N/A |  | Per UE | No | No | N/A | Candidate value set for component 4: {0, 1, 2}Candidate value set for component 5: {0, 1, 2}A UE supporting this feature shall also support the LCP restriction based on DCI priority indication ([*lch-ToGrantPriorityRestriction-r16*]) and intra-UE prioritization in MAC ([*lch-PriorityBasedPrioritization-r16*]). | Optional with capability signaling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm , Nokia/NSB

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon  | 1. The main bullet “Support intra-UE multiplexing/prioritization of overlapping PUCCH/PUCCH and PUCCH/PUSCH with two priority levels in physical layer (PHY)” depend on the email discussion #02 under CG AI, since the current wording doesn’t include PUSCH + PUSCH case.
 |
| Qualcomm | Note: some parts of the FL proposal is not related to FG 12-1 (it seems to be a typo.)* For component 1, the priority of PUCCH for SPS is also configured; this is not included.
* No prequisite FG is needed. The UE may only support a single codebook, but supports multiple services in the uplink.
* Type should take the band information into account; we prefer to have it as FSPC.
* The note on the relation to the MAC based capabilities is not clear. This needs some discussions.
 |
| Intel | * FG 11-4 need not be a pre-requisite
* Perhaps best to wait for resolution of CG-CG/CG-DG cases as pointed out by Huawei.
* In the Note column, modify as: A UE supporting this feature shall also support ~~the LCP restriction based on DCI priority indication ([~~*~~lch-ToGrantPriorityRestriction-r16~~*~~]) and~~ intra-UE prioritization in MAC ([*lch-PriorityBasedPrioritization-r16*]). Technical reason below:
	+ The support of LCP restriction based on DCI priority requires support of 12-1 as a pre-requisite, and this dependency is sufficient. A UE reporting support of FG #12-1 should not be mandated to also support DCI indication based LCP restriction.
 |
| Nokia, NSB | * The case of CG PUSCH versus DG PUSCH multiplexing/prioritization should be part of this FG as well, and hence we prefer to revert to the previous formulation. Otherwise we are fine with the FL proposals
 |
| Moderator (NTT DOCOMO) | Typo is corrected.Further discussion on following points seems necessary.* Whether or not to include PUSCH+PUSCH case
* Whether 11-4 is prerequisite FG or not
* Type
* Note on the relation to MAC based capabilities (whether suggested modification from Intel is fine for all)
 |
| Apple | * There is no need to have FG 11-4 as the pre-requisite, as we are separating the DL HARQ-ACK priority handling and UL SR/PUSCH priority handling.
* We prefer to have the type as per FSPC.
* Suggest changing the title to “UL intra-UE multiplexing/prioritization of overlapping channel/signals with two priority levels for SR and PUSCH in physical layer”. And similarly for the description: “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for SR and PUSCH in physical layer (PHY)”.
* Add a component “Supports a DCI format (from the formats 0\_1/0\_2) scheduling PUSCH with different priorities when only one of the DCI formats 0\_1 and 0\_2 is configured per BWP”, which seems to be missing after the UL DCI formats are removed from 11-4.
 |
| ZTE | Support the proposal with including PUSCH+PUSCH case |
|  |  |

### **Updated FL proposal 10:**

* **Component 1 is kept for FG12-1**
* **FG11-4 is a prerequisite feature group for FG12-1**
* **Type of FG12-1 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **The bracket is removed from Note for FG12-1**

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals:

|  |  |
| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | FG name and component description can be updated later since there is no ASN.1 impact.We should prioritize type discussion.Based on feedbacks so far,* Support per UE without xDD/FRx differentiation: Huawei, HiSi, Intel, Nokia, NSB, ZTE
* Supporte per FSPC: Qualcomm, Apple

So, clear reason for per FSPC or compromised proposal (e.g., per UE with FRx differentiation) is necessary. |
| Nokia, NSB | We agree that a very clear reason needs to be given to justify FSPC proposal. Otherwise we should agree with FL proposal. |
| Apple | As we commented for FG 11-4 and above, we do not see the need to have FG 11-4 as the prerequisite here. Please see our comments in the table above.We have a strong preference to have it per FSPC. As this FG involves various kinds of prioritization/cancellation/multiplexing, it is very processing intensive. Therefore, it is important to have finer granularity so that the UE does not have to under-report based on the worst band/band combination. |
| Huawei, HiSilicon | 1. It is not necessary to have FG 11-4 as the prerequisite. Since both can work independently now.
2. The main bullet of FG 12-1 “Support intra-UE multiplexing/prioritization of overlapping PUCCH/PUCCH and PUCCH/PUSCH with two priority levels in physical layer (PHY)” depend on the email discussion #02 under CG AI, since the current wording doesn’t include PUSCH + PUSCH case.
 |

## 3.2 FG12-2/2a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 12. NR\_IIOT | 12-2 | Multiple SPS configurations | 1. Support of up to 8 configured SPS configurations in a BWP of a serving cell and up to [16] configured SPS configurations in a cell group, including separate RRC parameters and separate activation/release for different SPS configurations
2. The max number of active SPS configurations in a BWP of a serving cell
3. The max number of active SPS configurations across all serving cells
4. The related HARQ-ACK enhancements to support multiple active SPS configurations
 | 5-18 DL SPS  | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] | Component-2, candidate value set is {1, 2, …, 8}Component-3, candidate value set is [{2, …, [16]}] | Optional with capability signaling |
| 12. NR\_IIOT | 12-2a | Joint release in a DCI for two or more SPS configurations for a given BWP of a serving cell | 1. M<=4 bits indication in the Release DCI is used for indicating which SPS configuration(s) is/are released, where the association between each state indicated by the indication and the SPS configuration(s) is

• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple SPS configurations to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the SPS configuration index indicated by the indication1. The related HARQ-ACK enhancements to support joint release
 | 12-2  | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] |  | Optional with capability signaling |

* **Components of FG12-2**
	+ **Maximum number of configured SPS configurations in Component 1:**
		- **Value is 16: [16]**
		- **Value is 32: [7], [10], [17]**
	+ **Clarify whether or not to remove “1” from the candidate value for component 2: [15]**
	+ **Clarify the maximum value of the candidate value for component 3**
		- **Value is 16: [16]**
		- **FFS: [15]**
* **Reporting type of FG12-2**
	+ **Per UE: [6], [9], [13], [15], [17]**
	+ **Per band: [16]**
* **Reporting type of FG12-2a**
	+ **Per UE: [6], [9], [13], [15], [17]**
	+ **Per band: [16]**
* **xDD/FRx diffentiation for FG12-2**
	+ **No differentiation is needed: [6], [9]], [15], [16], [17]**
* **xDD/FRx diffentiation for FG12-2a**
	+ **No differentiation is needed: [6], [9]], [15], [16], [17]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [6] | * FG 12-2/2a
	+ Set Type to ‘Per UE’.
	+ No need of FDD/TDD differentiation.
	+ No need of FR1/FR2 differentiation.
	+ Set ‘Capability interpretation for mixture of FDD/TDD and/or FR1/FR2’ to ‘N/A’.
 |
| [7] | It was agreed in RAN2 that up to 32 SPS configurations are supported per MAC entity. It is proposed to update the maximum number of SPS configurations according to RAN2’s agreements. |
| [9] | * FG 12-2/2a
	+ Per-UE
	+ No xDD/FRx differentiation
 |
| [10] | * FG 12-2
	+ Regarding [16], it is noted that RAN2 agreed that a MAC entity supports 32 total SPS configurations. So, it is preferable to keep 32, not 16.
 |
| [13] | * FG 12-2/2a
	+ We think per UE reporting type should be kept.
 |
| [15] | * FG 12-2
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
	+ Candidate value for component 2 should be {2, 3, …, 8} (remove “1” since it is supported by FG 5-18) and that for component 3 needs further discussion.
* FG 12-2a
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
 |
| [16] | * FG 12-2
	+ In component 1, remove the brackets.
	+ The signaling type should be per band.
	+ Based on the proposed signaling type, there is no need for TDD/FDD or FR1/FR2 differentiation. No need for interpretation either.
	+ In the note column, the upper bound for component 3 is 16. The brackets can be removed.
	+ Also, for component 3, add the following note: “Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2. Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values.”
* FG 12-2a
	+ The signaling type should be per band.
	+ Based on the proposed signaling type, there is no need for TDD/FDD or FR1/FR2 differentiation. No need for interpretation either.
 |
| [17] | * FG 12-2
	+ RAN2 has agreed to support up to 32 configurations already, hence it is unclear why limiting the capability support to 16 only here.
	+ Reporting type can be per UE, no xDD/FRy differentiation.
* FG 12-2a
	+ Reporting type can be per UE, no xDD/FRy differentiation.
 |

Based on above, following FL proposals are made.

### **FL proposal 11:**

* **Change “[16]” to “32” for Component 1 of FG12-2**
* **Maximum candidate value for component 3 of FG12-2 is 16**
* **Type of FG12-2/2a is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12. NR\_IIOT | 12-2 | Multiple SPS configurations | 1. Support of up to 8 configured SPS configurations in a BWP of a serving cell and up to 32 configured SPS configurations in a cell group, including separate RRC parameters and separate activation/release for different SPS configurations
2. The max number of active SPS configurations in a BWP of a serving cell
3. The max number of active SPS configurations across all serving cells
4. The related HARQ-ACK enhancements to support multiple active SPS configurations
 | 5-18 DL SPS  | Yes | N/A |  | Per UE | No | No | N/A | Component-2, candidate value set is {1, 2, …, 8}Component-3, candidate value set is [{2, …, 16}] | Optional with capability signaling |
| 12. NR\_IIOT | 12-2a | Joint release in a DCI for two or more SPS configurations for a given BWP of a serving cell | 1. M<=4 bits indication in the Release DCI is used for indicating which SPS configuration(s) is/are released, where the association between each state indicated by the indication and the SPS configuration(s) is

• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple SPS configurations to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the SPS configuration index indicated by the indication1. The related HARQ-ACK enhancements to support joint release
 | 12-2  | Yes | N/A |  | Per UE | No | No | N/A |  | Optional with capability signaling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm

|  |  |
| --- | --- |
| Company | Comment |
| Qualcomm | For 12-2:* 16 configured SPS configurations for SPS
* Per band capability type

We also propose to add the following note: “Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2. Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values.”For 12-2a:* Per-band as a signalling type
 |
| Intel | We support FL proposal 11. |
| Nokia, NSB | We support the FL proposal |
| Moderator (NTT DOCOMO) | The situation is only one company proposes to change the type to per band and to change the value 32 to 16.Therefore, my suggestion is to agree on current proposal (Per UE without differentiation and value 32). Or can e.g., per UE with FR1/FR2 differentiation be possible compromise?Regarding additional note suggested by Qualcomm, let’s check if it is acceptable to all. |
| Apple | We also prefer the type to be per band. |
| Qualcomm2 | As indicated before, we prefer the reporting of this FG to be per band. It is unclear why the UE has to support the same number of configurations in all bands especially considering the new HARQ-ACK CBs that can be supported in addition. If 12-2 is per band, then 12-2a should also be per band.Further, it is not clear why 32 configured configurations are needed within each cell group. Which use case exactly requires these many configurations? |
| ZTE | Not sure why the maximum candidate value of component 3 is 16 which is even smaller than up to 32 configured SPS configurations in a cell group. It also needs to clarify component 3 is per cell group or not. |
| Moderator (NTT DOCOMO) | Based on the feedbacks so far, still suggestion from moderator is to agree on current proposal. Or can we have per UE with FRx differentiation as compromise? |
| Huawei, HiSilicon | 1. Maximum value for component 3 should be 32 also? Since the main bullet says supporting up to 32 configurations. In addition, it is as what agreed in RAN2. Anyway it is reported by UE, if UE cannot support 32 then an report a smaller value.
 |

## 3.3 FG12-3/3a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 12. NR\_IIOT | 12-3 | SPS release by DCI format 1\_1 | Support of SPS release by DCI format 1\_1 | 5-18 DL SPS | Yes | N/A |  | [Per UE] | [No] | [No] | [TBD] | [A UE supporting this FG and 11-1 (DCI format 0\_2/1\_2) shall also support FG12-3a (SPS release by DCI format 1\_2).] | Optional with capability signaling |
| 12. NR\_IIOT | 12-3a | SPS release by DCI format 1\_2 | Support of SPS release by DCI format 1\_2 | 5-18 DL SPS and 11-1  | Yes | N/A |  | [Per UE] | [No] | [No] | [TBD] |  | Optional with capability signaling |

* **Reporting type of FG12-3**
	+ **Per UE: [6], [9], [13], [15], [17]**
	+ **Per band: [16]**
* **Reporting type of FG12-3a**
	+ **Per UE: [6], [9], [13], [15], [17]**
	+ **Per band: [16]**
* **xDD/FRx diffentiation for FG12-3**
	+ **No differentiation is needed: [6], [9]], [15], [16], [17]**
* **xDD/FRx diffentiation for FG12-3a**
	+ **No differentiation is needed: [6], [9]], [15], [16], [17]**
* **Note for FG 12-3**
	+ **Note is kept: [17]**
	+ **Note is removed: [9], [10], [11], [15], [16]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [6] | * FG 12-3/3a
	+ Set Type to ‘Per UE’.
	+ No need of FDD/TDD differentiation.
	+ No need of FR1/FR2 differentiation.
	+ Set ‘Capability interpretation for mixture of FDD/TDD and/or FR1/FR2’ to ‘N/A’.
 |
| [9] | * FG 12-3
	+ Per-UE
	+ No xDD/FRx differentiation
	+ Text in Notes column should be removed
* FG 12-3a
	+ Per-UE
	+ No xDD/FRx differentiation
 |
| [10] | * FG 12-3
	+ Remove [A UE supporting this FG and 11-1 (DCI format 0\_2/1\_2) shall also support FG12-3a (SPS release by DCI format 1\_2).]
 |
| [11] | * FG 12-3
	+ The text in ‘Note’ column should be removed
 |
| [13] | * FG 12-3/3a
	+ We think per UE reporting type should be kept.
 |
| [15] | * FG 12-3
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
	+ We don’t think the sentence in the bracket in the Note column is necessary
* FG 12-3a
	+ The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
 |
| [16] | * FG 12-3
	+ The signaling type should be per band.
	+ Based on the proposed signaling type, there is no need for TDD/FDD or FR1/FR2 differentiation. No need for interpretation either.
	+ The statement in the Note column should be removed.
* FG 12-3a
	+ The signaling type should be per band.
	+ Based on the proposed signaling type, there is no need for TDD/FDD or FR1/FR2 differentiation. No need for interpretation either.
 |
| [17] | * FG 12-3
	+ OK to remove brackets from the notes.
	+ Reporting type can be per UE, no xDD/Fry differentiation.
* FG 12-3a
	+ Reporting type can be per UE, no xDD/Fry differentiation.
 |

Based on above, following FL proposals are made.

### **FL proposal 12:**

* **Type of FG12-3/3a is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **Text is removed from the Note for FG12-3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12. NR\_IIOT | 12-3 | SPS release by DCI format 1\_1 | Support of SPS release by DCI format 1\_1 | 5-18 DL SPS | Yes | N/A |  | Per UE | No | No | N/A |  | Optional with capability signaling |
| 12. NR\_IIOT | 12-3a | SPS release by DCI format 1\_2 | Support of SPS release by DCI format 1\_2 | 5-18 DL SPS and 11-1  | Yes | N/A |  | Per UE | No | No | N/A |  | Optional with capability signaling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon | Support |
| Qualcomm | Per band signaling for both FGs |
| Intel | We support FL proposal 12. |
| Nokia/NSB | We support FL proposal in general, but it is unclear to us why the note is being removed.  |
| Moderator (NTT DOCOMO) | The situation is only one company proposes to change the type to per band.Therefore, my suggestion is to agree on current proposal (Per UE without differentiation). Or can e.g., per UE with FR1/FR2 differentiation be possible compromise?Regarding the removed note, further clarification from proponent is necessary. |
| Apple | Support Proposal 12 |
| Qualcomm2 | The type of signaling is dependent on the type for FG 11-1. We think both should be per band.  |
| ZTE | Support |
| Moderator (NTT DOCOMO) | There is clear majority support on “Per UE without xDD/FRx differentiation”. I suggest to agree on it. Or can we have FR1/FR2 differentiation as compromise? |
| Nokia, NSB | Agree to FL proposal |
| Huawei, HiSilicon  | Support |

## 3.4 FG12-5

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 12. NR\_IIOT | 12-5 | Configuration of aggregation factor per SPS configuration | Support of configurable PDSCH aggregation factor ({1, 2, 4, 8}) per DL SPS configuration | 5-18 DL SPS | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] |  | Optional with capability signaling |

* **Reporting type of FG12-5**
	+ **Per UE: [6], [9], [13], [15], [17]**
	+ **Per band: [16]**
* **xDD/FRx diffentiation for FG11-10**
	+ **No differentiation is needed: [6], [9], [15], [16], [17]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [6] | * FG 12-5
	+ Set Type to ‘Per UE’.
	+ No need of FDD/TDD differentiation.
	+ No need of FR1/FR2 differentiation.
	+ Set ‘Capability interpretation for mixture of FDD/TDD and/or FR1/FR2’ to ‘N/A’.
 |
| [9] | * FG 12-5
	+ Per-UE
	+ No xDD/FRx differentiation
 |
| [13] | * FG 12-5
	+ We think per UE reporting type should be kept.
 |
| [15] | * The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
 |
| [16] | * The signaling type should be per band.
* Based on the proposed signaling type, there is no need for TDD/FDD or FR1/FR2 differentiation. No need for interpretation either.
 |
| [17] | Reporting type can be per UE, no xDD/Fry differentiation. |

Based on above, following FL proposals are made.

### **FL proposal 13:**

* **Type of FG12-5 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12. NR\_IIOT | 12-5 | Configuration of aggregation factor per SPS configuration | Support of configurable PDSCH aggregation factor ({1, 2, 4, 8}) per DL SPS configuration | 5-18 DL SPS | Yes | N/A |  | Per UE | No | No | N/A |  | Optional with capability signaling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon | Support |
| Qualcomm | We propose to change the signaling type to per band. |
| Intel | We support FL proposal 13. |
| Moderator (NTT DOCOMO) | The situation is only one company proposes to change the type to per band.Therefore, my suggestion is to agree on current proposal (Per UE without differentiation). Or can e.g., per UE with FR1/FR2 differentiation be possible compromise? |
| Apple | Support Proposal 13 |
| Qualcomm2 | Not clear why the same aggregation factor should be supported in all bands. To meet the requirements of URLLC use cases, a per UE reporting for all bands is not required; e.g., in FR1 and FR2, the achievable latency values are quite different. |
| ZTE | Support |
| Moderator (NTT DOCOMO) | There is clear majority support on “Per UE without xDD/FRx differentiation”. I suggest to agree on it. Or can we have FR1/FR2 differentiation as compromise? |
| Nokia, NSB | Agree to FL proposal |
| Huawei, HiSilicon | Support |

## 3.5 FG12-6

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 12. NR\_IIOT | 12-6  | Support of SPS periodicity shorter than 10 ms | Support of SPS periodicity shorter than 10 ms | 5-18 DL SPS | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  |  | Optional with capability signalling |

* **Reporting type of FG12-6**
	+ **Per UE: [6], [9], [13], [15], [17]**
	+ **Per band: [16]**
* **xDD/FRx diffentiation for FG12-6**
	+ **No differentiation is needed: [6], [9], [15], [16], [17]**

Above remaining issues and proposals are identified based on following feedbacks provided in contributions for the RAN1#101-e meeting.

|  |  |
| --- | --- |
| [6] | * FG 12-6
	+ Set Type to ‘Per UE’.
	+ No need of FDD/TDD differentiation.
	+ No need of FR1/FR2 differentiation.
	+ Set ‘Capability interpretation for mixture of FDD/TDD and/or FR1/FR2’ to ‘N/A’.
 |
| [9] | * FG 12-6
	+ Per-UE
	+ No xDD/FRx differentiation
 |
| [13] | * FG 12-5
	+ We think per UE reporting type should be kept.
 |
| [15] | * The capability should be reported in the granularity of per UE and no xDD/FRx differentiation are needed
 |
| [16] | * The signaling type should be per band.
* Based on the proposed signaling type, there is no need for TDD/FDD or FR1/FR2 differentiation. No need for interpretation either.
 |
| [17] | Reporting type can be per UE, no xDD/Fry differentiation. |

Based on above, following FL proposals are made.

### **FL proposal 14:**

* **Type of FG12-6 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12. NR\_IIOT | 12-6  | Support of SPS periodicity shorter than 10 ms | Support of SPS periodicity shorter than 10 ms | 5-18 DL SPS | Yes | N/A |  | Per UE | No | No | N/A  |  | Optional with capability signalling |

Companies are encouraged to check above FL proposals and to provide feedback if any in below. If you cannot accept the FL proposals, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposals: Qualcomm

|  |  |
| --- | --- |
| Company | Comment |
| Huawei/HiSilicon | Support |
| Qualcomm | We propose to change the signaling type to per band. |
| Intel | We support FL proposal 14. |
| Nokia, NSB | We support FL proposal |
| Moderator (NTT DOCOMO) | The situation is only one company proposes to change the type to per band.Therefore, my suggestion is to agree on current proposal (Per UE without differentiation). Or can e.g., per UE with FR1/FR2 differentiation be possible compromise? |
| Apple | We also prefer to have it as per band. |
| Qualcomm | The same as our response to the previous SPS related FGs, there are different considerations in different bands to meet the reliability/latency requirements. A UE is not needed to support the URLLC related features in all bands equally. |
| ZTE | Support |
| Moderator (NTT DOCOMO) | Based on feedbacks so far,* Support per UE without xDD/FRx differentiation: Huawei, HiSi, Intel, Nokia, NSB, ZTE
* Supporte per band: Qualcomm, Apple

So, still suggestion from moderator is to agree on current proposal. If it is not acceptable, compromised proposal (e.g., per UE with FRx differentiation) is necessary. |
| Nokia, NSB | Support FL proposal. |
| Huawei, HiSilicon | Support. We are fine if companies really prefer per band as the reporting type.  |

1. Conclusion

**FL proposal 1:**

* **Type of FG11-1/1a is “Per UE”**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**

**FL proposal 2:**

* **Component 2 is removed for FG11-2**
* **A new component on maximum number of DL and UL unicast DCI formats in a span is added**
	+ **Candidate value: same as 3-5b**
	+ **Type:**
* **Type of FG11-2 is Per FS for component 1 and per BC for component 2**
* **3-5b is removed from prerequisite feature groups for FG11-2**

**FL proposal 3:**

* **Component 3 is removed for FG11-3**
* **Type of FG11-3 is Per UE or Per FS (in bands or BCs with large number of carriers or large BW, the UE’s processing power is spent on PDCCH/PDSCH decoding. Hence, in some cases, the support of the new codebook or some codebook configurations may not be possible)**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FFS text is removed from Note for FG11-3**

Agreements:

* FFS: Component 4 and 6 are kept for FG11-4/4a
* FFS: Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK” as new component for FG11-4
* FG11-3 is removed from prerequisite feature groups for FG11-4
* FFS: FG11-3 and 11-4 are prerequisite feature groups for FG11-4a
* FFS: Type of FG11-4/4a is Per FS
* The bracket is removed from Note for FG11-4

**Updated FL proposal 4:**

* **Component 4 is kept and component 6 is removed for FG11-4/4a**
* **Add “Support intra-UE multiplexing/prioritization of UL overlapping channels/signals with two priority levels for HARQ-ACK” as new component for FG11-4**
* **FG11-3 and 11-4 are prerequisite feature groups for FG11-4a**
* **Type of FG11-4/4a is Per FS**
	+ **Add a note “Per FS is selected because in bands or BCs with large number of carriers or large BW, the UE’s processing power is spent on PDCCH/PDSCH decoding and hence in some cases, the support of the new codebook or some codebook configurations may not be possible”**

Agreements:

* FFS: Type of FG11-6 is Per UE
	+ Need of FDD/TDD differentiation is “No”
	+ Need of FR1/FR2 differentiation is “No”
* FFS: FG5-17 is a prerequisite feature group for FG11-6
* FFS text is removed from the Note for FG11-6

**Updated FL proposal 5:**

* **Type of FG11-6 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **FG5-17 is a prerequisite feature group for FG11-6**

Agreements:

* Text within bracket in Component 1 is kept for FG11-7
* Text within bracket below Component 3 is removed for FG11-7
* FFS: Type of FG11-7/7a is Per FS
* FFS: The bracket is removed from Note for FG11-7/7a, and add 11-2/2a in the note

**Updated FL proposal 6:**

* **Type of FG11-7/7a is Per FS**
* **The bracket is removed from Note for FG11-7/7a**

Agreements:

* FFS: Component 2 and 3 are kept for FG11-9
	+ Candidate values for component 2: {1, 2, 4, 8, 12}
	+ Candidate values for component 3: {2, …, 24}
	+ “configured/active” in component 2/3 is changed to “configured”
* One of {5-19, 5-20} is a prerequisite feature group for FG11-9
* FG 11-9 is a prerequisite feature group for FG11-9a
* FFS: Type of FG11-9/9a is Per UE or per band
	+ Need of FDD/TDD differentiation is “No”
	+ Need of FR1/FR2 differentiation is “No”
* FFS: Add following notes for FG11-9
	+ The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15
	+ For component 3: Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values
* Remove note for FG11-9a

**Updated FL proposal 7:**

* **Component 2 and 3 are kept for FG11-9**
	+ **Candidate values for component 2: {1, 2, 4, 8, 12}**
	+ **Candidate values for component 3: {2, …, 24}**
	+ **“configured/active” in component 2/3 is changed to “configured”**
* **Type of FG11-9/9a is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “Yes”**
* **Add following notes for FG11-9**
	+ **The number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15**
	+ **For component 3: Total number in FR1 is not greater than X value reported for FR1. Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values**

Agreements:

* FFS: Type of FG11-10 is Per UE
	+ Need of FDD/TDD differentiation is “No”
	+ Need of FR1/FR2 differentiation is “No”
* FG5-20 is a prerequisite feature group for FG11-10
* FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received
* FFS: Text is removed from the Note for FG11-10

**Updated FL proposal 8:**

* **Type of FG11-10 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **Text is kept in the Note for FG11-10**

Agreements:

* FFS: Type of FG11-11 is Per UE
	+ Need of FDD/TDD differentiation is “No”
	+ Need of FR1/FR2 differentiation is “No”
* FG5-20 and 5-11 are prerequisite feature groups for FG11-11
* FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received
* FFS: Text is removed from the Note for FG11-11

**Updated FL proposal 9:**

* **Type of FG11-11 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **Text is kept in the Note for FG11-11**

**FL proposal 10:**

* **Component 1 is kept for FG12-1**
* **FG11-4 is a prerequisite feature group for FG12-1**
* **Type of FG12-1 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **The bracket is removed from Note for FG12-1**

**FL proposal 11:**

* **Change “[16]” to “32” for Component 1 of FG12-2**
* **Maximum candidate value for component 3 of FG12-2 is 16 (per cell group)**
* **Type of FG12-2/2a is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**

**FL proposal 12:**

* **Type of FG12-3/3a is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**
* **Text is removed from the Note for FG12-3**

**FL proposal 13:**

* **Type of FG12-5 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**

**FL proposal 14:**

* **Type of FG12-6 is Per UE**
	+ **Need of FDD/TDD differentiation is “No”**
	+ **Need of FR1/FR2 differentiation is “No”**

Reference

[1] R1-2003199 Summary on email discussion [100b-e-NR-UEFeatures-Remaining] NR\_L1enh\_URLLC Moderator (NTT DOCOMO, INC.)

[2] R1-2003200 Summary on email discussion [100b-e-NR-UEFeatures-Remaining] NR\_IIoT Moderator (NTT DOCOMO, INC.)

[3] R1-2003316 UE features for URLLC China Unicom

[4] R1-2003333 Discussion on UE feature for URLLC/IIoT ZTE

[5] R1-2003418 Discussion on URLLC/IIOT UE features vivo

[6] R1-2003446 On UE Features for URLLC and IIoT Ericsson

[7] R1-2003606 Discussion of UE features for NR URLLC/IIoT CATT

[8] R1-2003695 Views on Rel-16 UE features for NR URLLC/IIoT MediaTek Inc.

[9] R1-2003755 On UE features for Rel-16 eURLLC and IIoT Intel Corporation

[10] R1-2003897 UE features for URLLC/IIoT Samsung

[11] R1-2004036 Discussion on UE features for URLLC/IIoT LG Electronics

[12] R1-2004122 Discussion on UE features for URLLC/IIoT OPPO

[13] R1-2004157 Rel-16 UE features for URLLC Huawei, HiSilicon

[14] R1-2004243 Discussions on UE Features for URLLC/IIoT Apple

[15] R1-2004405 Rel-16 UE features for URLLC/IIoT NTT DOCOMO, INC

[16] R1-2004480 Discussion on eURLLC and IIOT UE features Qualcomm Incorporated

[17] R1-2004563 On UE features for URLLC/IIOT Nokia, Nokia Shanghai Bell

[18] R1-2001484 RAN1 UE features list for Rel-16 NR after RAN1#100-E Moderator (AT&T, NTT DOCOMO, INC.)

Appendix: latest version of UE features list for URLLC [1]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****( 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-1 | Monitoring DCI format 1\_2 and DCI format 0\_2 | 1. Supports monitoring DCI format 1\_2 for DL scheduling
2. Supports monitoring DCI format 0\_2 for UL scheduling
 |  | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  |  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-1a | Monitoring both DCI format 0\_1/1\_1 and DCI format 0\_2/1\_2 in the same search space  | 1. Supports monitoring both DCI format 0\_1/1\_1 and DCI format 0\_2/1\_2 in the same search space
 | 11-1 | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] |  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-2 | Rel-16 PDCCH monitoring capability  | 1. Supported combination(s) of (X, Y, μ). For each reported combination, the UE supports the limit C on the maximum number of non-overlapped CCEs for channel estimation per PDCCH monitoring span and the limit M on the maximum number of monitored PDCCH candidates per PDCCH monitoring span
2. [If UE reports the support of more than one combination of (X, Y) for a given SCS, and if multiple combinations of (X, Y) are valid for the span pattern, the combination (X, Y) with the maximum value of C and M from the valid combinations is applied]
3. Capability on the number of CCs for monitoring a maximum number of BDs and non-overlapped CCEs per span when configured with DL CA with Rel-16 PDCCH monitoring capability on all the serving cells.
 | 3-5b (TBD) | Yes | N/A |  | [FSPC]FFS: Compoent 3) reported per UE | [N/A] | [N/A] | [N/A] | This capability is signaled for SCS 15 kHz and 30 kHz. For μ=0 and 1, candidate value set for (X, Y, μ): {(7, 3, μ), (4, 3, μ), (2, 2, μ)}For component 1, a list of separate UE capabilities (X, Y, μ)for processing capability #1;For component 1, a list of separate UE capabilities (X, Y, μ)for processing capability #2;For component 3, if UE supports carrier aggregation with more than 2 DL carriers with Rel-16 PDCCH monitoring capability on all the carriers, UE should report this capability.Candidate value for component 3: {2, 3, …, 16} | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-3 | More than one PUCCH for HARQ-ACK transmission within a slot | 1. Supports sub-slot based HARQ-ACK feedback procedure.

• A UL slot consists of a number of sub-slots. No more than one transmitted PUCCH carrying HARQ-ACKs starts in a sub-slot.• At least one sub-slot configuration for PUCCH can be UE specifically configured to a UE. • Supports a single configuration for PUCCH resource for all sub-slots in a slot. The starting symbol of a PUCCH resource is defined with respect to the first symbol of sub-slot. Any sub-slot PUCCH resource is not across sub-slot boundaries. 1. Supported sub-slot configuration
2. [Supported combinations of (A, B), where A is the minimum gap between sub-slots containing actual PUCCH transmissions measured from beginning to beginning of the sub-slots, including across slots, and B is the sub-slot duration, with both A and B in units of symbols]
 |  | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  | Candidate value set for component 2:{ 7-symbol\*2, 2-symbol\*7 and 7-symbol\*2} for NCP or { 6-symbol\*2, 2-symbol\*6 and 6-symbol\*2} for ECP[Candidate value set for component 3):(A, B) = {(7, 7),(4, 2) and (7, 7),(2, 2) and (7, 7)}]FFS: Whether to keep component 3) and accordingly the above note for component 3)FFS “no more than one transmitted PUCCH carrying HARQ-ACKs starts in a sub-slot” for multi-TRP support” | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-4 | Two HARQ-ACK codebooks with up to one sub-slot based HARQ-ACK codebook (i.e. slot-based + slot-based, or slot-based + sub-slot based) simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed with the restriction up to one sub-slot based HARQ-ACK codebook.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. [Supports a DCI format (from the formats 1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured per BWP]
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. [Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot]
 | [11-3] (TBD) | Yes | N/A |  | FFS [Per UE or Per FS] | [No] | [No] | [N/A]  | [If a UE reports both 11-3 and 11-4, it can support two slot-based HARQ-ACK codebooks, and one slot-based and one-sub-slot-based HARQ-ACK codebooks. If a UE reports 11-4 but not 11-3, it can only support two slot-based HARQ-ACK codebooks.] | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-4a | Two sub-slot based HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE  | 1. Supports two sub-slot based HARQ-ACK codebooks with different priorities to be simultaneously constructed.
2. Supports separate PUCCH configuration for different HARQ-ACK codebooks
3. Supports 2-level priority of HARQ-ACK for dynamically scheduled PDSCH and SPS PDSCH.
4. [Supports a DCI format (from the formats /1\_1/1\_2) scheduling PDSCH with different HARQ-ACK priorities when only DCI format 0\_1/1\_1 is configured or only DCI format 0\_2/1\_2 is configured in USS per BWP]
5. Supports separate configuration of parameters PDSCH-HARQ-ACK-Codebook, UCI-OnPUSCH and ‘codeBlockGroupTransmission” for different HARQ-ACK codebooks.
6. [Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot]
 | [11-3] and [11-4] (TBD) | Yes | N/A |  | FFS [Per UE or Per FS] | [No] | [No] | [N/A] |  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | [11-4b] | [DL priority indication in DCI with mixed DCI formats] | [DL priority indication in DCI with mixed DCI formats] | 11-1a, 11-4 (TBD) | Yes | N/A |  | Per UE | [No] | [No] | [N/A]  |  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-6 | PUSCH repetition Type A | 1. PUSCH transmission with Rel-15 behavior with or without slot aggregation.

• With slot aggregation, the number of repetitions can be dynamically indicated (as agreed for Rel-16).• When dynamically indicated, the number of repetitions is jointly coded with SLIV in TDRA table, by adding an additional column for the number of repetitions in the TDRA table. | [5-17] | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  | FFS: Whether to add a component for the supported maximum number of PUSCH repetitions | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-7 | UL cancelation scheme for self-carrier | 1. Supports group common DCI (i.e. DCI format 2\_4) for cancelation indication [on the same DL CC as that scheduling PUSCH or SRS]
2. UL cancelation for PUSCH
* Cancellation is applied to each PUSCH repetition individually in case of PUSCH repetitions
1. UL cancelation for SRS symbols that overlap with the cancelled symbols

[For the serving cell, the UE determines the first symbol of the $T\_{CI}$ symbols to be the first symbol that is after $T\_{proc,2}+d$ from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where $d$ is provided by higher layer.]  |  | Yes | N/A |  | [Per UE]FFS: FS | [No] | [No] | [N/A]  | [More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b]  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-7a | UL cancelation scheme for cross-carrier | 1. Supports group common DCI (i.e. DCI format 2\_4) for cancelation indication [on a different DL CC than that scheduling PUSCH or SRS]
2. UL cancelation for PUSCH
* Cancellation is applied to each PUSCH repetition individually in case of PUSCH repetitions
1. UL cancelation for SRS symbols that overlap with the cancelled symbols

[For the serving cell, the UE determines the first symbol of the $T\_{CI}$ symbols to be the first symbol that is after $T\_{proc,2}+d$ from the end of a PDCCH reception where the UE detects the DCI format 2\_4, where $d$ is provided by higher layer.]  |  | Yes | N/A |  | [Per UE]FFS: FS | [No] | [No] | [N/A]  | [More than one monitoring occasion for DCI format 2\_4 per slot is applied only if the UE reports to support FG 3-5 or FG 3-5a or FG 3-5b]  | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | [11-7b] | [Independent cancellation of the overlapping PUSCHs in an intra-band UL CA] | [For a UE indicating the capability of pa-PhaseDiscontinuityImpacts, and if the PUSCH on at least one serving cell is cancelled, the UE may cancel the (repetition of the) PUSCHs transmission on all other intra-band serving cell(s). The cancellation of the (repetition of the) PUSCH transmission on a the set of intra-band serving cell(s) includes all symbols from the earliest symbol that is overlapping with the first cancelled symbol of the PUSCH on the serving cell for which the DCI format 2\_4 is applicable to.] | 6-23, 11-7 (TBD) | Yes | N/A |  | [Per band] | [N/A] | [N/A] | TBD | FFS: Whether to add this FG and the content for each column if added | Optional with capability signaling |
| 11. NR\_L1enh\_URLLC | 11-9 | Multiple active configured grant configurations for a BWP of a serving cell | 1. Supports up to 12 configured/active configured grant configurations in a BWP of a serving cell.

• Separate RRC parameters for different configured grant configurations• Separate activation for different configured grant Type 2 configurations• Separate release for different configured grant Type 2 configurations1. [Supported maximum number of configured/active configured grant configurations in a BWP of a serving cell]
2. [Supported maximum number of configured/active configured grant configurations across all serving cells]
 | TBDFFS: 5-19 or 5-20 | Yes | N/A |  | [Per UE]FFS: FSPC | [No] | [No] | [N/A]  |  | Optional with capability signallingFFS: Candidate value for component 2: {1, 2, …, 12}FFS: Candidate value for component 3: {2, …, [32]} |
| 11. NR\_L1enh\_URLLC | 11-9a | Joint release in a DCI for two or more configured grant Type 2 configurations for a given BWP of a serving cell | 1. M<=4 bits indication in the Release DCI is used for indicating which CG configuration(s) is/are released, where the association between each state indicated by the indication and the CG configuration(s) is

• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple CG configurations to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the CG configuration index indicated by the indication | 11-9 (TBD) | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  | FFS: A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1). A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2). | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-10  | Type 2 configured grant release by DCI format 0\_1  | 1. Support of type 2 configured grant release by DCI format 0\_1
 | 5-20 | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received | [A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2).] | Optional with capability signalling |
| 11. NR\_L1enh\_URLLC | 11-11  | Type 2 configured grant release by DCI format 0\_2 | 1. Support of type 2 configured grant release by DCI format 0\_2
 | 5-20, 11-1 | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received | [A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1).] | Optional with capability signalling |

Appendix: latest version of UE features list for IIoT [1]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****( 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 12. NR\_IIOT | 12-1 | UL intra-UE multiplexing/prioritization of overlapping channel/signals with two priority levels in physical layer | Support intra-UE multiplexing/prioritization of overlapping PUCCH/PUCCH and PUCCH/PUSCH with two priority levels in physical layer (PHY)1. [Configuration of PHY priority level for CG PUSCH and SR, and dynamic indication of priority level for dynamic PUSCH with a single DCI format]
2. Multiplexing/prioritization between UL channels/signals with the same PHY priority level
3. Prioritization between UL channels/signals with different PHY priority levels
4. Additional number of symbols (d1) needed beyond the PUSCH preparation time for cancelling a low priority UL transmission.
5. Additional number of symbols (d2) needed beyond the PUSCH preparation time for scheduling a high priority UL transmission that cancels a low priority UL transmission
 | [11-4] | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] | Candidate value set for component 4: {0, 1, 2}Candidate value set for component 5: {0, 1, 2}[A UE supporting this feature shall also support the LCP restriction based on DCI priority indication ([*lch-ToGrantPriorityRestriction-r16*]) and intra-UE prioritization in MAC ([*lch-PriorityBasedPrioritization-r16*]).] The relationship between this feature and the feature of up to two HARQ-ACK codebooks of 11-4 and 11-4xshould be further discussed. | Optional with capability signaling |
| 12. NR\_IIOT | [12-1a] | [UL priority indication in DCI with mixed DCI formats] | [UL priority indication in DCI with DCI format 0\_1 and 0\_2] | 12-1 and 11-1TBD | Yes | N/A | FFS | Per UE | [No] | [No] | [N/A]  |  | Optional with capability signalling |
| 12. NR\_IIOT | 12-2 | Multiple SPS configurations | 1. Support of up to 8 configured SPS configurations in a BWP of a serving cell and up to [16] configured SPS configurations in a cell group, including separate RRC parameters and separate activation/release for different SPS configurations
2. The max number of active SPS configurations in a BWP of a serving cell
3. The max number of active SPS configurations across all serving cells
4. The related HARQ-ACK enhancements to support multiple active SPS configurations
 | 5-18 DL SPS  | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] | Component-2, candidate value set is {1, 2, …, 8}Component-3, candidate value set is [{2, …, [16]}] | Optional with capability signaling |
| 12. NR\_IIOT | 12-2a | Joint release in a DCI for two or more SPS configurations for a given BWP of a serving cell | 1. M<=4 bits indication in the Release DCI is used for indicating which SPS configuration(s) is/are released, where the association between each state indicated by the indication and the SPS configuration(s) is

• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple SPS configurations to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the SPS configuration index indicated by the indication1. The related HARQ-ACK enhancements to support joint release
 | 12-2  | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] |  | Optional with capability signaling |
| 12. NR\_IIOT | 12-3 | SPS release by DCI format 1\_1 | Support of SPS release by DCI format 1\_1 | 5-18 DL SPS | Yes | N/A |  | [Per UE] | [No] | [No] | [TBD] | [A UE supporting this FG and 11-1 (DCI format 0\_2/1\_2) shall also support FG12-3a (SPS release by DCI format 1\_2).] | Optional with capability signaling |
| 12. NR\_IIOT | 12-3a | SPS release by DCI format 1\_2 | Support of SPS release by DCI format 1\_2 | 5-18 DL SPS and 11-1  | Yes | N/A |  | [Per UE] | [No] | [No] | [TBD] |  | Optional with capability signaling |
| 12. NR\_IIOT | 12-5 | Configuration of aggregation factor per SPS configuration | Support of configurable PDSCH aggregation factor ({1, 2, 4, 8}) per DL SPS configuration | 5-18 DL SPS | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A] |  | Optional with capability signaling |
| 12. NR\_IIOT | 12-6  | Support of SPS periodicity shorter than 10 ms | Support of SPS periodicity shorter than 10 ms | 5-18 DL SPS | Yes | N/A |  | [Per UE] | [No] | [No] | [N/A]  |  | Optional with capability signalling |