**3GPP TSG RAN WG1 #100bis-e R1-20xxxxx**

e-Meeting, April 20th – 30th, 2020

Source: NTT DOCOMO, INC.

Title: Summary on Email discussion [100b-e-NR-UEFeatures-MRDCCA-03]

Agenda Item: 7.2.11.10

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

# **Introduction**

This contribution summarizes the following email discussion in AI 7.2.11.10 regarding UE features for MR-DC/CA.

[100b-e-NR-UEFeatures-MRDCCA-03] Email discussion/approval on feature group structure for other MR-DC/CA enhancements than UL power sharing for NR-DC and cross-carrier operation with different SCS (20th-24th April) – Hiroki (DCM)

* For 18-2 component 3, discuss whether or not to clarify HARQ subframe offset is optional for EN-DC with LTE TDD PCell
* Discuss whether new FG18-4b for “SCell dormancy indication without data scheduling within active time” is added or not
* Confirm to keep FG18-2/2a/3/3a/4/4a/7/8

# **18-2/18-2a/18-3/18-3a:** **Enhancements to Single Tx Switched Uplink Solution for EN-DC**

In [1], FG18-2, 18-2a, 18-3 and 18-3a are captured as below.

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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 |
| 18. MR-DC/CA enhancement | 18-2 | Single UL TX operation for TDD PCell in intra-band EN-DC | TDM restriction to LTE TDD PCell in EN-DC for *singleUL-Transmission* associated functionality when *tdm-patternConfig-r16* is configured1) TDD UL/DL configuration#2, #4, #5 configured as DL-reference UL/DL configuration 2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ subframe offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern[5) if UE indicates that it does not support simultaneous UL transmissions as defined in TS 38.101-3 [4] using *singleUL-Transmission*, NR (SCG) UL transmission is dropped when an overlapping LTE (MCG) UL transmission is present (for type 1 UE).”] | EN-DC |  | N/A |  | Per band combination | Applicable to TDD-TDD EN-DC only | Applicable to FR1 only |  | Extension of the R15 capability *tdm-Pattern* to TDD PCell3) {not supported, supported} | Optional with capability signalling |
| 18-2a | Enhanced single UL TX operation for FDD Pcell EN-DC | TDM restriction to LTE FDD Pcell in EN-DC for *singleUL-Transmission* associated functionality when *tdm-patternConfig-r16* is configured1) DL-reference UL/DL configuration defined for LTE-FDD-SCell in LTE-TDD-FDD CA with LTE-TDD-PCell2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ sub-frame offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern (for type 1 UE)[5) if UE indicates that it does not support simultaneous UL transmissions as defined in TS 38.101-3 [4] *using singleUL-Transmission*, NR (SCG) UL transmission is dropped when an overlapping LTE (MCG) UL transmission is present (for type 1 UE).”] | 6-13 |  | N/A |  | Per band combination | Applicable to in FDD-LTE TDD-NR EN-DC | Applicable to FR1 only |  | Enhancement to the R15 capability *tdm-Pattern* | Optional with capability signalling |
| 18-3 | Dual Tx transmission for EN-DC with FDD PCell(TDM pattern for dual Tx UE) | TDM restriction to LTE FDD PCell in EN-DC for dual UL Tx operation when *tdm-patternConfig-r16* is configured1) DL-reference UL/DL configuration defined for LTE-FDD-SCell in LTE-TDD-FDD CA with LTE-TDD-PCell2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ subframe offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern | EN-DC |  | N/A |  | Per band combination | Applicable to EN-DC with LTE FDD PCell only | Applicable to FR1 only |  | Extension of the R15 capability *tdm-Pattern* to a 2Tx UE | Optional with capability signalling |
| 18-3a | Semi-statically configured LTE UL transmissions in all UL subframes not limited to tdm-pattern | UE configured with *tdm-patternConfig-r16* can be semi-statically configured with LTE UL transmissions in all UL subframes not limited to the reference tdm-pattern | 18-2, 18-2a |  |  |  | Per UE |  |  |  |  | Optional with capability signaling |

Following views are provided in contributions for the RAN1#100bis-e meeting.

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| [2] | ZTE Corporation | For Component 4 of FG-2, FG-2a and FG-3, the description ‘LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern’ is not very clear. ‘Any UL subframe of the TDM pattern’ seems to refer to the UL subframes designated as UL by TDM. However, FG-2a says this is only for type1 UE, which make this description confusing. We propose to update the Component 4 of FG-2, FG-2a and FG-3 as below.4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe ~~of the TDM pattern~~ (for type1 UE). |
| [4] | Intel Corporation | HARQ subframe offset is agreed as optional feature for EN-DC with LTE TDD PCell in RAN1#98, which is not clearly reflected in FG 18-2 “3) HARQ subframe offset”. Since FG 18-3a was created for semi-static configured LTE UL transmission, component 4) in FG 18-2/2a/3 could be revised to apply to dynamic LTE UL transmission only. “3) Dynamic LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern (for type 1 UE)”. **Proposal 2: for single TX** * **FG 18-2, component 3, to clarify ARQ subframe offset is optional for EN-DC with LTE TDD PCell**
* **FG 18-3a, component 3, to clarify it is for dynamic LTE UL transmissions**
 |
| [5] | Ericsson | * FGs 18-2,18-2a
	+ Regarding component 5,
		- We propose to confirm addition of component 5. If shorter description is desirable it can be reworded as follows – “dropping of NR (SCG) UL transmission when an overlapping LTE (MCG) UL transmission is present (for Type 1 UEs that indicate lack of support of simultaneous UL transmissions using *singleUL-Transmission*)”.
 |
| [7] | Qualcomm Incorporated | We propose to update the latest feature groups as following. * Some changes on top of Rapporteur’s updated list are suggested.
* We propose to clarify that EN-DC single-Tx operation is for synchronous EN-DC.
* FG18-2a and FG18-3a can be UE capabilities that generally allows LTE UL transmissions outside the HARQ-ACK designated subframes for single-Tx operation.
* Some editorial changes have been made. Component [5] added in the Rapproteur’s version is not necessary, as it is the UE behavior, not the component of the UE feature group.

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| 18-2 | Single UL TX operation for TDD Pcell in intra-band EN-DC | TDM restriction to LTE TDD Pcell in EN-DC for *singleUL-Transmission* associated functionality when *tdm-patternConfig-r16* is configured1) TDD UL/DL configuration#2, #4, #5 configured as DL-reference UL/DL configuration 3) HARQ subframe offset] | EN-DC |  | N/A |  | Per band combination | Applicable to synchronous EN-DC with TDD-Pcell only | Applicable to FR1 only |  | Extension of the R15 capability *tdm-Pattern* to TDD Pcell3) {not supported, supported} | Optional with capability signalling |
| 18-2a | Enhanced single UL TX operation for FDD Pcell EN-DC | TDM restriction to LTE FDD Pcell in EN-DC for *singleUL-Transmission* associated functionality when *tdm-patternConfig-r16* is configured1) DL-reference UL/DL configuration defined for LTE-FDD-Scell in LTE-TDD-FDD CA with LTE-TDD-Pcell2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ sub-frame offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframes (for type 1 UE)5) semi-statically configured LTE UL transmissions in any UL subframes (for type 1 UE)] | 6-13 |  | N/A |  | Per band combination | Applicable to synchronous EN-DC with FDD-Pcell only | Applicable to FR1 only |  | Enhancement to the R15 capability *tdm-Pattern* | Optional with capability signalling |
| 18-3 | Dual Tx transmission for EN-DC with FDD Pcell(TDM pattern for dual Tx UE) | TDM restriction to LTE FDD Pcell in EN-DC for dual UL Tx operation when *tdm-patternConfig-r16* is configured1) DL-reference UL/DL configuration defined for LTE-FDD-Scell in LTE-TDD-FDD CA with LTE-TDD-Pcell2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ subframe offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern5) semi-statically configured LTE UL transmissions in any UL subframes (for type 1 UE) | EN-DC |  | N/A |  | Per band combination | Applicable to EN-DC with LTE FDD PCell only | Applicable to FR1 only |  | Extension of the R15 capability *tdm-Pattern* to a 2Tx UE | Optional with capability signalling |
| 18-3a | LTE UL transmissions in all UL subframes for FG18-2 | For a UE configured with *tdm-patternConfig-r16* for EN-DC single-Tx operation with TDD-Pcell, LTE UL transmissions in all UL subframes, not limite to tdm-pattern, is allowed1) PRACH transmission in non-designated UL subframes given by the DL-reference configuration (for type 1 UE)2) LTE UL transmissions scheduled/triggered by a DCI in any UL subframes (for type 1 UE)3) semi-statically configured LTE UL transmissions in any UL subframes (for type 1 UE) | 18-2 |  |  |  | Per band combination | Applicable to synchronous EN-DC with TDD-Pcell only |  |  |  | Optional with capability signaling |

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| [8] | Huawei, HiSilicon | * **FG 18-2**

The “intra-band” in the name of FG 18-2 should be removed, because it is not aligned with WID nor agreements. In the WID or agreements of RAN1 for single TX enhancement, there is no limitations that the MCG and the SCG should be in the same band.“3) HARQ subframe offset” should be modified to “HARQ subframe offset (Optional feature with Rel-15 FG 8-1 as prerequisite feature)”. This is exactly shown in the agreement, since it should be a separate capability signaling for HARQ subframe offset. One alternative is to take this component out and create a new FG for it.”There should be a space between “single” and “UL” as captured in TS 38.306. Also its Italic format should be removed. This comment is also applied to FG 18-2a.“Component 5” about association with 38.101-3 should be removed because it causes big confusion by overlapping with component 4, and not sustained by any agreement. This comment is also applied to FG 18-2a.***Proposal 2:*** *For FG 18-2 the following should be accepted.** *The “intra-band” in the name of FG 18-2 should be removed*
* *“3) HARQ subframe offset” should be modified to “HARQ subframe offset (Optional feature with Rel-15 FG 8-1 as prerequisite feature)”*
* *There should be a space between “single” and “UL”*
* *“Component 5” about association with 38.101-3 should be removed, as well as in FG 18-2a*
* **FG 18-2a**

“TDD” should be removed from “Applicable to in FDD-LTE TDD-NR EN-DC”, which is not aligned with agreements.***Proposal 3:*** *Remove “TDD” from “Applicable to in FDD-LTE TDD-NR EN-DC” in FG 18-2a.** **FG 18-3a**

Add 18-3 as prerequisite according to the RAN1#99 agreement***Proposal 4:*** *Add 18-3 as prerequisite in FG 18-3a according to the RAN1#99 agreement.*

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| 18-2 | Single UL TX operation for TDD PCell in EN-DC | TDM restriction to LTE TDD PCell in EN-DC for *singleUL-Transmission* associated functionality when *tdm-patternConfig-r16* is configured1) TDD UL/DL configuration#2, #4, #5 configured as DL-reference UL/DL configuration 2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ subframe offset (Optional feature with Rel-15 FG 8-1 as prerequisite feature)4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern |  | Per band combination | Applicable to TDD-TDD EN-DC only | Applicable to FR1 only | Extension of the R15 capability *tdm-Pattern* to TDD PCell3) {not supported, supported} | Optional with capability signalling |
| 18-2a | Enhanced single UL TX operation for FDD Pcell EN-DC | TDM restriction to LTE FDD Pcell in EN-DC for *singleUL-Transmission* associated functionality when *tdm-patternConfig-r16* is configured1) DL-reference UL/DL configuration defined for LTE-FDD-SCell in LTE-TDD-FDD CA with LTE-TDD-PCell2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ sub-frame offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern (for type 1 UE) |  | Per band combination | Applicable to in FDD-LTE NR EN-DC | Applicable to FR1 only | Enhancement to the R15 capability *tdm-Pattern* | Optional with capability signalling |
| 18-3a | Semi-statically configured LTE UL transmissions in all UL subframes not limited to tdm-pattern | UE configured with *tdm-patternConfig-r16* can be semi-statically configured with LTE UL transmissions in all UL subframes not limited to the reference tdm-pattern | 18-2, 18-2a, *18-3* | Per UE |  |  |  | Optional with capability signaling |

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Based on above, following points need to be discussed for FG18-2/2a/3/3a.

* Confirm to keep FG18-2/2a/3/3a
* For 18-2 component 3, discuss whether or not to clarify HARQ subframe offset is optional for EN-DC with LTE TDD PCell
* Discuss whether new FG18-4b for “SCell dormancy indication without data scheduling within active time” is added or not

## 2.1 Discussion 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| 18-2 | Single UL TX operation for TDD PCell in intra-band EN-DC | TDM restriction to LTE TDD PCell in EN-DC for *singleUL-Transmission* associated functionality when *tdm-patternConfig-r16* is configured1) TDD UL/DL configuration#2, #4, #5 configured as DL-reference UL/DL configuration 2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ subframe offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern[5) if UE indicates that it does not support simultaneous UL transmissions as defined in TS 38.101-3 [4] using *singleUL-Transmission*, NR (SCG) UL transmission is dropped when an overlapping LTE (MCG) UL transmission is present (for type 1 UE).”] | EN-DC |  | N/A |  | Per band combination | Applicable to TDD-TDD EN-DC only | Applicable to FR1 only |  | Extension of the R15 capability *tdm-Pattern* to TDD PCell3) {not supported, supported} | Optional with capability signalling |
| 18-2a | Enhanced single UL TX operation for FDD Pcell EN-DC | TDM restriction to LTE FDD Pcell in EN-DC for *singleUL-Transmission* associated functionality when *tdm-patternConfig-r16* is configured1) DL-reference UL/DL configuration defined for LTE-FDD-SCell in LTE-TDD-FDD CA with LTE-TDD-PCell2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ sub-frame offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern (for type 1 UE)[5) if UE indicates that it does not support simultaneous UL transmissions as defined in TS 38.101-3 [4] *using singleUL-Transmission*, NR (SCG) UL transmission is dropped when an overlapping LTE (MCG) UL transmission is present (for type 1 UE).”] | 6-13 |  | N/A |  | Per band combination | Applicable to in FDD-LTE TDD-NR EN-DC | Applicable to FR1 only |  | Enhancement to the R15 capability *tdm-Pattern* | Optional with capability signalling |
| 18-3 | Dual Tx transmission for EN-DC with FDD PCell(TDM pattern for dual Tx UE) | TDM restriction to LTE FDD PCell in EN-DC for dual UL Tx operation when *tdm-patternConfig-r16* is configured1) DL-reference UL/DL configuration defined for LTE-FDD-SCell in LTE-TDD-FDD CA with LTE-TDD-PCell2) PRACH transmission in non- designated UL subframes given by the DL-reference configuration (for type 1 UE)3) HARQ subframe offset4) LTE UL transmissions scheduled/triggered by a DCI in any UL subframe of the TDM pattern | EN-DC |  | N/A |  | Per band combination | Applicable to EN-DC with LTE FDD PCell only | Applicable to FR1 only |  | Extension of the R15 capability *tdm-Pattern* to a 2Tx UE | Optional with capability signalling |
| 18-3a | Semi-statically configured LTE UL transmissions in all UL subframes not limited to tdm-pattern | UE configured with *tdm-patternConfig-r16* can be semi-statically configured with LTE UL transmissions in all UL subframes not limited to the reference tdm-pattern | 18-2, 18-2a |  |  |  | Per UE |  |  |  |  | Optional with capability signaling |

**The proposal is to confirm that FG18-2/2a/3/3a are kept.**

**Companies are encouraged to provide views if there is a concern or comment on the proposal.**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE | We are fine to confirm that FG18-2/2a/3/3a are kept with the understanding that the components with brackets and the Prerequisite of some UE features are subject to further discussion. |
| Nokia, NSB | OK to keep them. |
| Qualcomm | OK to keep them, subject to the understanding that we can still discuss any details of the FGs and any potential additional FGs. I.e., our understanding is that “FG18-2/2a/3/3a are kept” here means at least we will preserve 4 rows for EN-DC single-Tx/dual-Tx.Propose to reformulate the 4 rows as following:* For EN-DC single-Tx with FDD-PCell (FG18-2a):
	+ Any types of LTE UL transmissions are NOT limited to tdm-pattern.
		- Including semi-static LTE UL
* For EN-DC dual-Tx with FDD-PCell (FG18-3):
	+ Any types of LTE UL transmissions are NOT limited to tdm-pattern.
		- Including semi-static LTE UL
* For EN-DC single-Tx with TDD-PCell (FG18-2):
	+ Any types of LTE UL transmissions are limited to tdm-pattern.
		- Including semi-static LTE UL
* For advanced EN-DC single-Tx with TDD-PCell (FG18-3a):
	+ Any types of LTE UL transmissions are NOT limited to tdm-pattern.
		- Including semi-static LTE UL

If the above proposal is not acceptable, update the following.* On FG18-2:
	+ Component 4 should be (for type1 UE)
	+ Component 5 should be deleted
* On FG18-2a:
	+ Component 5 should be deleted
* On FG18-3a:
	+ Should be per BC
	+ Should be only for type 1 UE (as per RAN1#99 agreement)
 |
| Samsung | OK to keep them. |
| Intel | OK to keep them |
| MTK | Agree with ZTE/QC. Ok to keep them with further discussion on the bracketed componenets |
| Ericsson | OK to keep them. |
| Huawei, HiSilicon | We expect a LS will be sent to RAN2 with FG 18-2/2a/3/3a, therefore, we are OK to keep them only if the following editorial change is adopted and make clear what is for further discussions, i.e. * For FG 18-2/2a, there should be a space between “single” and “UL” as captured in TS 38.306. Also its Italic format should be removed. Otherwise, the UE feature is bound to IMD issue because *singleUL-Transmission* is the UE capability signaling for IMD.
* For FG 18-2, “intra-band” in the FG name should be put in brackets for further discussions.
 |
| Apple | OK to keep them. Also agree with Huawei that for FG 18-2, “intra-band” in the FG name should be removed or put in bracket. |

## 2.2 Discussion 2

**Companies are encouraged to provide views on whether or not to clarify HARQ subframe offset is optional for EN-DC with LTE TDD PCell for component 3 of FG18-2 (whether or not to remove component 3 and to add a new FG).**

 **Adding the new FG supported by:**

 **Objected by:**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE | We prefer to clarify HARQ subframe offset is optional for EN-DC with LTE TDD PCell for component 3 of FG18-2, which is in line with RAN1’s agreements. This could also be clarified in the field description in RAN2’s spec. |
| Qualcomm | Following was agreed at the RAN1#98 meeting.**RAN1-98 (August 2019)**Agreements:* […]
* Support HARQ-offset for SUO case1 in EN-DC with LTE TDD PCell
* Note: from UE perspective, it is expected that HARQ-offset value doesn’t violate the DL/UL configuration (in SIB1).
* For type 1 UE, the feature is optional. FFS for type 2 UE.
 |
| Samsung | Agree with QC. |
| Intel | Since HARQ subframe offset is agree as optional, it could be a new FG. The other way is to have configurable value 0 of HARQ subframe offset. They are equivalent. However, by this way, it means HARQ subframe offset is always supported thought the value is 0  |
| MTK | Agree with QC. A new FG for this should be added. |
| Huawei, HiSilicon | A new FG for this is needed. |
| Apple | A new FG should be added for HARQ-offset |

# **18-4/18-4a: SCell dormancy indication**

In [1], FG18-4 and 18-4a are captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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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 |
| 18. MR-DC/CA enhancement | 18-4 | SCell dormancy within active time | Support for SCell dormancy indication sent within the active time on PCell with DCI format 0\_1/1\_1 |  |  | N/A |  | Per UE | No | No |  |  | Optional with capability signalling |
| 18-4a | SCell dormancy outside active time | Support for SCell dormancy indication sent outside the active time on PCell with DCI format 2\_6 | [19-1] |  |  |  | Per UE | No | No |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#100bis-e meeting.

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| [3] | MediaTek Inc. | For FG 18-4, two Cases of SCell dormancy indication are supported when the indication is sent within DRX Active Time.* Case 1 SCell dormancy indication:
	+ DCI format 0\_1 and 1\_1 with additional bit field “SCell dormancy indication” are used.
	+ Case 1 DCI can still schedule PDSCH/PUSCH, and the timeline for HARQ-ACK information feedback is the same as N1 in Rel-15.
	+ 1 bit in “SCell dormancy indication” indicates SCell dormancy/non-dormancy for a group of SCells.
* Case 2 SCell dormancy indication:
	+ DCI format 1\_1 with some repurposed bit fields is used.
	+ Case 2 DCI cannot schedule PDSCH but UE still needs to report HARQ-ACK information. Its HARQ-ACK report timeline is tighter than in Case 1. (working assumption: timeline is the same as in HARQ-ACK information report for SPS PDSCH release).
	+ 1 bit of SCell dormancy indication indicates SCell dormancy/non-dormancy for a SCell.

Because of many differences between Case 1 and Case 2 SCell dormancy indication, it is more reasonable to have separated FGs for them. We suggest the following revisions:**Proposal 2:*** **FG 18-4: SCell dormancy indication with data scheduling within active time**
	+ **Support for SCell dormancy indication sent within the active time on PCell with DCI format 0\_1/1\_1 scheduling PUSCH/PDSCH**
* **Add FG 18-4b: SCell dormancy indication without data scheduling within active time**
	+ **Support for SCell dormancy indication sent within the active time on PCell via DCI format 1\_1 without PDSCH scheduling**

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| 18-4 | SCell dormancy indication with data scheduling within active time | Support for SCell dormancy indication sent within the active time on PCell with DCI format 0\_1/1\_1 scheduling PUSCH/PDSCH |  |  | N/A |  | Per UE | No | No |  |  | Optional with capability signalling |
| 18-4a | SCell dormancy outside active time | Support for SCell dormancy indication sent outside the active time on PCell with DCI format 2\_6 | 19-1 |  |  |  | Per UE | No | No |  |  | Optional with capability signalling |
| 18-4b | SCell dormancy indication without data scheduling within active time | Support for SCell dormancy indication sent within the active time on PCell via DCI format 1\_1 without PDSCH scheduling |  |  | N/A |  | Per UE | No | No |  |  | Optional with capability signaling |

 |
| [4] | Intel Corporation | FG 18-4: There is no PDCCH/PDSCH transmission for a dormant BWP. A UE supporting one dormant BWP plus one non-dormant BWP is not equal to support two BWPs with PDCCH/PDSCH transmissions. Therefore, it is better to clarify that a prerequisite condition is UE capability of supporting at least 2 BWPs. Otherwise, it is not clear regarding the relation between SCell dormancy and multi-BWP operation. **Proposal 3: for SCell dormancy,** * **FG 18-2, component 3, to clarify that a prerequisite condition is UE capability of supporting at least 2 BWPs.**
 |
| [6] | Nokia, Nokia Shanghai Bell | **18-4:** * Should be clear that there are two cases, the DCI format scheduling PUSCH/PDSCH and the DCI format not scheduling PDSCH. We do not propose this to be split in separate capabilities but clarify that both cases are supported.

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| 18-4 | SCell dormancy within active time | Support for SCell dormancy indication sent within the active time on PCell with DCI format 0\_1/1\_11. DCI format 1\_1 without scheduling PDSCH
2. DCI format 0\_1/1\_1 with scheduling PUSCH/PDSCH
 |

 |
| [7] | Qualcomm Incorporated | On FG 18-4 and 18-4a, there was a comment “Rapporteur: see comments above” to our previous proposal for email discussion. This comment seems to refer to a similar proposal form Huawei. However, there was no comments under Huawei’s proposal either. We prefer “per band combination” so that it provides more flexibility to UE to selectively support Scell dormancy. Besides we observed that most of the feature groups in MR/DC-CA enhancement are also “Per band combination” which is aligned with our proposal for Scell dormancy.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18-4 | Scell dormancy within active time | Support for Scell dormancy indication sent within the active time on Pcell with DCI format 0\_1/1\_1 |  |  | N/A |  | Per band combination | No | No |  |  | Optional with capability signalling |
| 18-4a | Scell dormancy outside active time | Support for Scell dormancy indication sent outside the active time on Pcell with DCI format 2\_6 | [19-1] |  | N/A |  | Per band combination | No | No |  |  | Optional with capability signalling |

 |
| [8] | Huawei, HiSilicon | * **FG 18-4/4a**

FG 6-5/6-6 should be as pre-requisiteChange the reporting type from ‘per UE’ to ‘per BC’, and at this stage please put per UE in bracket. ***Proposal 5:*** *FG 6-5/6-6 should be as pre-requisite and Change the reporting type from ‘per UE’ to ‘per BC’ in FG 18-4/4a*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18-4 | SCell dormancy within active time | Support for SCell dormancy indication sent within the active time on PCell with DCI format 0\_1/1\_1 | *FG 6-5/6-6* | *Per BC* | No | No |  | Optional with capability signalling |
| 18-4a | SCell dormancy outside active time | Support for SCell dormancy indication sent outside the active time on PCell with DCI format 2\_6 | [19-1] , *FG 6-5/6-6* | *Per BC* | No | No |  | Optional with capability signalling |

 |

Based on above, following points need to be discussed for FG18-4/4a.

* Confirm to keep FG18-4/4a
* Whether new FG18-4b for “SCell dormancy indication without data scheduling within active time” is added or not

## 3.1 Discussion 3

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| 18-4 | SCell dormancy within active time | Support for SCell dormancy indication sent within the active time on PCell with DCI format 0\_1/1\_1 |  |  | N/A |  | Per UE | No | No |  |  | Optional with capability signalling |
| 18-4a | SCell dormancy outside active time | Support for SCell dormancy indication sent outside the active time on PCell with DCI format 2\_6 | [19-1] |  |  |  | Per UE | No | No |  |  | Optional with capability signalling |

**The proposal is to confirm that FG18-4/4a are kept.**

**Companies are encouraged to provide views if there is a concern or comment on the proposal.**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE | We support to confirm that FG18-4/4a are kept. |
| Nokia, NSB | OK to keep FG18-4/4a. Please note that there are two cases, the DCI format scheduling PUSCH/PDSCH and the DCI format not scheduling PDSCH. We do not propose this to be split in separate capabilities but at some point we should clarify that both cases are supported.  |
| Qualcomm | We support to keep FG18-4/4a. |
| Samsung | We OK to keep FG 18-4/4a. |
| Intel | We are supportive to keep FG 18-4/4a. |
| MTK | We support to keep FG18-4/4a. |
| Ericsson | Support to keep 18-4/4a |
| Huawei | OK with FL proposal and also with Nokia modifications. |
| Apple | Support keeping 18-4/4a |

## 3.2 Discussion 4

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| 18-4b | SCell dormancy indication without data scheduling within active time | Support for SCell dormancy indication sent within the active time on PCell via DCI format 1\_1 without PDSCH scheduling |  |  | N/A |  | Per UE | No | No |  |  | Optional with capability signaling |

**Companies are encouraged to provide views on whether new FG18-4b for “SCell dormancy indication without data scheduling within active time” is added or not.**

 **Adding the new FG supported by:**

 **Objected by:**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE | We prefer not to introduce this UE feature.Based on our understanding, the UE implementation of Case1 or Case2 are basically the same. Maybe the proponents could further clarify the intention to have this separate UE feature. |
| Nokia, NSB | We prefer not to introduce the UE feature as the need for it is not clear. |
| Qualcomm | Support to have this capability. |
| Samsung | Support to have FG 18-4b. |
| Intel | We prefer not to introduce 18-4b |
| MTK | Support to have this capability. The UE implementation of Case1 or Case2 are different due to the reason that HARQ timing requirement for Case1/Case2 is different. |
| Ericsson | Prefer not to add separate 18-4b |
| Huawei | Ok without separate 18-4b. The PDCCH reading capability is almost the same between case 1 and case 2. The case of 18-4b for without PDSCH scheduling requires even less capability. |
| Apple | Support to have this capability |

# **18-7: CA with non-aligned frame boundaries**

In [1], FG18-7 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| 18. MR-DC/CA enhancement | 18-7 | CA with non-aligned frame boundaries | CA with non-aligned frame boundaries for inter-band CA |  |  | N/A |  | Per band combination | No | No |  | Defines whether the UE supports carrier aggregation operation where the frame boundaries of the Pcell and the Scell are not aligned, while the slot boundaries are. | Optional with capability signalling |

Following view is provided in contributions for the RAN1#100bis-e meeting.

|  |  |  |
| --- | --- | --- |
| [7] | Qualcomm Incorporated | * There should be a signaling structure recommended to RAN2, where the UE can indicate the grouping of cells across which the UE is capale of applying time offsets. For example, the UE can only apply offset between TDD bands but not between FDD bands, etc.
 |

## 4.1 Discussion 5

**The proposal is to confirm that FG18-7 is kept.**

**Companies are encouraged to provide views if there is a concern or comment on the proposal.**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE | We support to keep the FG18-7.Regarding the Qualcomm’s proposal, seems like the current “per BC” indication could serve the same purpose. |
| Nokia, NSB | It is OK to keep it. |
| Samsung | OK to keep this FG. |
| Intel | OK to keep this FG. |
| MTK | OK to keep this FG. |
| Ericsson | OK to keep 18-7 |
| Huawei | Ok |
| Apple | OK to keep |

# **18-8: HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group**

In [1], FG18-8 is captured with bracket as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| 18. MR-DC/CA enhancement | 18-8 | HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group | HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group | 6-7 |  | N/A |  | Per UE | No | No |  | Support HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group.Rel-15 had this per cell group | [Optional with capability signalling or Mandatory conditioned to support for multiple PUCCH groups 6-7] |

Following views are provided in contributions for the RAN1#100bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [3] | MediaTek Inc. | For FG 18-8: HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group, since this is a new Rel-16 feature, it should be optional with capability signaling.**Proposal 6: FG “18-8 HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group” should be optional with capability signaling.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18-8 | HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group | HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group | 6-7 |  | N/A |  | Per UE | No | No |  | Support HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group.Rel-15 had this per cell group | Optional with capability signalling |

 |
| [6] | Nokia, Nokia Shanghai Bell | **18-8**: Support that this is a mandatory feature for Rel-16 UEs supporting FG6-7 |
| [8] | Huawei, HiSilicon | * **FG 18-8**

There is no need to restrict to same SCS case only with only 6-7 as the pre-requisite, so 6-8 can also be pre-requisite FG and/or the condition for mandatory support.***Proposal 6:*** *There is no need to restrict to same SCS case only with only 6-7 as the pre-requisite in FG 18-8* |

## 5.1 Discussion 6

**The proposal is to confirm that FG18-8 is kept.**

**Companies are encouraged to provide views if there is a concern or comment on the proposal.**

|  |  |
| --- | --- |
| Company | Comment |
| ZTE | We are fine to keep the FG18-8. |
| Nokia, NSB | It is OK to keep it. This could become mandatory with a capability, when we discuss these aspects. |
| Samsung | OK to keep this FG. |
| Intel | OK to keep this FG. |
| MTK | OK to keep this FG. |
| Ericsson | OK to keep 18-8 |
| Huawei | OK |

# **Conclusion**

Following agreements were made.

**Agreements:**

* A new FG (18-2b) for support of HARQ-offset for SUO case1 in EN-DC with LTE TDD PCell for type 1 UE is introduced
* FG18-4/4a are kept.
* FG18-7 is kept.
* FG18-8 is kept.

**Proposal:**

Reformulate FG18-2/2a/3/3a as below

* For EN-DC single-Tx with FDD-PCell (FG18-2a):
	+ Any types of LTE UL transmissions are NOT limited to tdm-pattern.
		- Including semi-static LTE UL
* For EN-DC dual-Tx with FDD-PCell (FG18-3):
	+ Any types of LTE UL transmissions are NOT limited to tdm-pattern.
		- Including semi-static LTE UL
* For EN-DC single-Tx with TDD-PCell (FG18-2):
	+ Any types of LTE UL transmissions are limited to tdm-pattern.
		- Including semi-static LTE UL
* For advanced EN-DC single-Tx with TDD-PCell (FG18-3a):
	+ Any types of LTE UL transmissions are NOT limited to tdm-pattern.
		- Including semi-static LTE UL

Alternative proposal for updating FG18-2/2a/3/3a

* Keep FG18-2 for Single UL TX operation for TDD PCell in intra-band EN-DC
	+ Component 4 should be (for type1 UE)
	+ Component 5 should be deleted
* Keep FG18-2a for Enhanced single UL TX operation for FDD Pcell EN-DC
	+ Component 5 should be deleted
* Keep FG18-3 for Dual Tx transmission for EN-DC with FDD PCell(TDM pattern for dual Tx UE)
* Keep FG18-3a for Semi-statically configured LTE UL transmissions in all UL subframes not limited to tdm-pattern
	+ Should be per BC
	+ Should be only for type 1 UE (as per RAN1#99 agreement)

**Proposal:**

* A new FG (18-4b) for support of SCell dormancy indication without data scheduling within active time is introduced

TBD

# **References**

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

[2] R1-2001631 Discussion on UE feature for MR-DC CA ZTE

[3] R1-2001833 Views on Rel-16 UE features for MR-DC/CA MediaTek Inc.

[4] R1-2002024 UE feature for MR-DC Intel Corporation

[5] R1-2002426 Discussion on UE features for MR-DC Ericsson

[6] R1-2002477 On UE features for MR-DC/CA Nokia, Nokia Shanghai Bell

[7] R1-2002571 Discussion on UE features for MR-DC/CA Qualcomm Incorporated

[8] R1-2002595 Rel-16 UE features for MR-DC/CA Huawei, HiSilicon