**3GPP TSG RAN WG1 #102e R1-2007021**

**e-Meeting, August 17th – 28th, 2020**

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

**Title:** **Summary on [102-e-NR-UEFeatures-TEI-02]**

**Agenda Item:** **7.2.11**

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

1. Introduction

This contribution summarizes the following email discussion/approval in AI 7.2.11.

[102-e-NR-UEFeatures-TEI-02] Email discussion/approval on mandatory/optional for NR TEI (after the completion of TEI-01) by 8/26 – Hiroki (DCM)

* Whether the FG14-8 is mandatory with capability signaling or optional with capability signaling, including possibility of mandatory for UEs supporting with 4 or more carriers
1. FG14-8

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 14. NR TEI | 14-8 | CSI trigger states containing non-active BWP | 1. CSI trigger states containing non-active BWP
 |  | Yes | N/A |  | Per UE | No | No | N/A | Agreements:TEI – “CSI trigger states containing non-active BWP”・When a UE is triggered with a CSI report for a DL BWP that is non-active, the UE is not expected to report the CSI for the non-active BWP and the CSI report associated with the BWP is omitted.・When a UE is triggered with aperiodic CSI-RS in a DL BWP that is non-active, the UE is not expected to measure the aperiodic CSI-RS. ・The above non-active BWP is the non-active BWP when receiving the associated CSI-RS with the following relaxation for UE processing. In the CC of the associated CSI-RS, if the active BWP when receiving the CSI-RS is different from the active BWP when receiving the triggering DCIThe last symbol of the PDCCH span of the DCI carrying the BWP switching shall be no later than the last symbol of the PDCCH span of the CSI trigger DCI, irrespective of whether they are in the same CC or not and irrespective of whether they are in the same SCS or not.The UE is not expected to have any other BWP switching in that CC after the last symbol of the PDCCH span covering CSI trigger DCI and before the first symbol of the triggered CSI-RS resource.・Note: the UE is not required to measure P/SP-CSI-RS in the non-active BWP per current specification | [Mandatory or Optional] with capability signaling |

Following proposals are made in contributions.

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| --- | --- | --- | --- | --- | --- | --- |
| [2] | One remaining issue on Rel-16 NR TEI is whether the following 14-8 is mandatory with capability signalling or optional with capability signalling.

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| --- | --- | --- | --- | --- |
| 14. NR TEI | 14-8 | CSI trigger states containing non-active BWP | 1. CSI trigger states containing non-active BWP
 | [Mandatory or Optional] with capability signaling |

Per RAN1 common understanding, this feature is critical to NW’s operation involving multiple carriers or BWPs. The reason that companies want to introduce this FG is to reserve time for UE vendors to implement and test this feature. To make it mandatory with capability signalling will resolve companies’ concern on product timeline. After the IoT test of the features to enable multi-carrier/BWP operation, this feature should be mandatorily supported to ensure the NW works well. Hence, we support to make it mandatory with capability signalling. ***Proposal 5:*** *Support to make 14-8 mandatory with capability signalling.* |
| [4] | We prefer **FG 14-8 CSI trigger states containing non-active BWP** to be **mandatory with capability signalling.** We realize thatthis might be too challenging to some low performance UEs, but since the feature is essential for supporting deployment with large number of component carriers, we the FG to be conditionally mandatory for such UEs. For UEs supporting less than X carriers in CA this feature can be optional. X can for instance be 4.1. FG 14-8 is “mandatory with capability signalling feature” for UEs supporting CA with 4 or more carriers and optional for UEs supporting less than 4 carrier CA.
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Based on the above contributions, it is agreed to discuss following point in the email discussion [5].

**Discussion point #3**

* **Whether the FG14-8 is mandatory with capability signaling or optional with capability signaling, including possibility of mandatory for UEs supporting with 4 or more carriers**

## 2.1 Proposal and discussion

Based on the contributions, following proposal is made. Making FG14-8 as mandatory for all Rel-16 UEs may be concerned by some companies as in previous meeting, and hence compromised proposal in [4] can be the starting point for discussion in this meeting.

### **FL proposal 1:**

* **FG14-8 is mandatory with capability signaling for UEs supporting CA with more than 3 carriers**
* **FG14-8 is optional with capability signaling for UEs not supporting CA with more than 3 carriers**

Companies are encouraged to check above FL proposal 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 | We do not agree with the proposal. FG14-8 should be optional with capability signaling, same as all other TEIs that are not related to initial access.  |
| OPPO | We share the same view as Qualcom that we should the same principle that R16 advanced features should be optional except the one related to initial access. Thus FG14-8 should be optional with capability signalling  |
| Ericsson | In our opinion: NOT all of the mandatory features must be related to initial access; just as NOT all the spec text is associated with a UE feature. It is understandable a low performance UE, not capable of supporting multiple CC, does not support FG14-8. For a high-performance UE, supporting 4 or more than CC, for the sake of UE’s own performance to reduce singnaling overhead during the transition period when acticate/deactivate a CC, the FG14-8 shall be supported as mandatory. It is mutully beneficial for both gNB and UE.  |
| ZTE | We support FL proposal. Our view is similar as Ericsson’s. This feature is tied with multi-CC operation. FL proposal means not all UEs need to implement this feature. For a UE supporting relatively large number of CCs, without this feature, multi-CC operation cannot work properly anyway. So to make the UE capability reporting tied with the supported number of CCs is a reasonable way forward, considering we have discussed this issue for several meetings.  |
| Nokia | There is no IoDT reason in a feature like this to have a capability bit in the first place, and the most sensible way forward would be to make this a Rel-16 mandatory feature without any signalling. As this is obviously not possible, we would support the FL proposal. Here the signalling part would not really be needed for the UEs for which it is mandatory, but as the signalling needs to be there for the UEs for which it is optional, the FL proposal as it now stands is a reasonable compromise. |
| Apple | FG14-8 should be optional with capability signalling irrespective of the number of CCs. None of the Rel-15 UE supports this, and they are all in the market, we do not even understand how it can even help NW to force Rel-16 UE to support this  |

1. Conclusion

**FL proposal 1:**

* **FG14-8 is mandatory with capability signaling for UEs supporting CA with more than 3 carriers**
* **FG14-8 is optional with capability signaling for UEs not supporting CA with more than 3 carriers**

Reference

[1] R1-2006462 Updated RAN1 UE features list for Rel-16 NR Moderators (AT&T, NTT DOCOMO, INC.)

[2] R1-2005423 Discussion on NR Rel-16 UE Features ZTE

[3] R1-2006677 Remaining aspects of Rel-16 UE features Nokia, Nokia Shanghai Bell

[4] R1-2006874 Remaining details of Rel-16 NR UE features Ericsson

[5] R1-2006714 Summary on UE features for TEIs Moderator (NTT DOCOMO, INC.)

Appendix: UE features list for NR TEI in [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****(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 |
| 14. NR TEI | 14-1 | Multiple LTE-CRS rate matching patterns | 1. Maximum number of LTE-CRS rate matching patterns in total within a NR carrier using 15 kHz SCS
2. Maximum number of LTE-CRS non-overlapping rate matching patterns within a NR carrier using 15 kHz SCS
 | 5-28 (Rate-matching around LTE CRS) | Yes | N/A |  | Per band | N/A | N/A (FR1 only) | N/A | For DSSThe number of the additional CRS rate matching patterns reported in Rel-16 is accounted in the total number of rate matching pattern reported by the UE for Rel-15 by using pdsch-RE-MappingFR1-PerSymbol/pdsch-RE-MappingFR1-PerSlot and pdsch-RE-MappingFR1-PerSymbol/pdsch-RE-MappingFR1-PerSlotUE reporting component 1 for 14-1 also reports component 2.Reporting of values of Component 1 larger than two is only applicable when reporting values of Component 2 larger than one. | Optional with capability signallingComponent 1:{2, 3, 4, 5, 6}Component 2: {1, 2, 3} |
| 14. NR TEI | 14-1a | Two LTE-CRS overlapping rate matching patterns within a part of NR carrier using 15 kHz overlapping with a LTE carrier | 1. Support of two LTE-CRS overlapping rate matching patterns within a part of NR carrier using 15 kHz SCS overlapping with a LTE carrier
 | 14-1  | Yes | N/A |  | Per band | N/A | N/A (FR1 only) | N/A | For DSSThe number of the additional CRS rate matching patterns reported in Rel-16 is accounted in the total number of rate matching pattern reported by the UE for Rel-15 by using pdsch-RE-MappingFR1-PerSymbol/pdsch-RE-MappingFR1-PerSlot and pdsch-RE-MappingFR1-PerSymbol/pdsch-RE-MappingFR1-PerSlot | Optional with capability signaling |
| 14. NR TEI | 14-2 | PDSCH Type B mapping of length 9 and 10 OFDM symbols | 1. support of PDSCH Type B scheduling of length 9 and 10 OFDM symbols
2. support of DMRS shift for length-10 symbols
 | 5-6a (PDSCH mapping type B)  | Yes | N/A |  | Per band | N/A | N/A (FR1 only) | N/A | For DSSFG10-8 covers PDSCH type B mapping without DMRS shift due to CRS collision. | Optional with capability signaling |
| 14. NR TEI | 14-3 | One slot periodic TRS configuration for FR1 | 1. UE can be configured with one-slot periodic TRS configuration only when no two consecutive slots are indicated as downlink slots by tdd-UL-DL-ConfigurationCommon or tdd-UL-DL-ConfigDedicated
 | 2-51 (CSI-RS for tracking) | Yes | N/A |  | Per band | N/A (TDD only) | N/A (FR1 only) | N/A | UE can be configured with one-slot periodic TRS configuration only when no two consecutive slots are indicated as downlink slots by tdd-UL-DL-ConfigurationCommon or tdd-UL-DL-ConfigDedicated.This FG is not also applicable for the case that all slots are indicated as flexible  | Optional with capability signalling |
| 14. NR TEI | 14-4 | SRS Tx switch with allowing downgrading configuration | 1) Support SRS Tx port switch | 2-55 | Yes | N/A |  | Per BC (same reporting type as srs-TxSwitch in Rel-15) | N/A | N/A | N/A | Agreement:•Rel-16 UE capability design for SRS antenna switching in conjunction with the existing Rel-15 UE capability should allow UE to indicate support of one of the following combinations o{t1r1, t1r2}o{t1r1, t1r2, t1r4}o{t1r1, t1r2, t2r2, t2r4}o{t1r1, t2r2}o{t1r1, t2r2, t4r4}o{t1r1, t1r2, t2r2, t1r4, t2r4}oNote: Detailed signaling design is up to RAN2 | Optional with capability signallingComponent 1: Candidate value set:{o{t1r1, t1r2}o{t1r1, t1r2, t1r4}o{t1r1, t1r2, t2r2, t2r4}o{t1r1, t2r2}o{t1r1, t2r2, t4r4}o{t1r1, t1r2, t2r2, t1r4, t2r4}}Component2: Candidate value set: {yes, no}Component 3: Candidate value set: {yes, no} |
| 14. NR TEI | 14-5 | Half-duplex UE behaviour in TDD CA for same SCS | 1. Support for directional collision handling between reference and other cell(s) for half-duplex operation in CA with same SCS
 | 6-5 and simultaneousRxTxInterBandCA not supported | Yes | N/A |  | Per BC | N/A (TDD only) | N/A | N/A | Half duplex UEs that do not indicate this capability should still be able to operate half-duplex TDD CA (i.e. simultaneousRxTxInterBandCA not supported) per Rel15 specifications if network ensures same transmission direction across all the serving cells | Optional with capability signaling |
| 14. NR TEI | 14-6 | New RACH configuration for FR1 TDD | 1. new RACH configuration entries with subframe number 2 and/or 7 for RACH periodicity longer than 10 ms
 |  | No | N/A |  | N/A | N/A (TDD only) | N/A (FR1 only) | N/A | Agreement:•A new UE capability is not introduced for this TEI, i.e., it is a mandatory UE feature for Rel-16. | Mandatory without capability signalling |
| 14. NR TEI | 14-7 | New capability for beamSwitchTiming values of 224 and 336 | 1. Indicates the minimum number of required OFDM symbols {224, 336} between the DCI triggering aperiodic CSI-RS and the corresponding aperiodic CSI-RS transmission in a CSI-RS resource set configured with repetition ‘ON’
* Candidate values: {224, 336}
 | 2-28 | Yes | N/A |  | Per band | N/A | N/A (FR2 only) | N/A | Agreements:・48 is used as the beam switching threshold for Ues reporting 224 or 336ØWhen using the higher values of the feature (sym224 and sym336), beamSwitchTiming indicates the minimum number of OFDM symbols between the DCI triggering of aperiodic CSI-RS and aperiodic CSI-RS transmission in a CSI-RS resource configured with repetition ‘ON’ to apply TCI indication in CSI-RS triggering DCI. | Optional with capability signaling |
| 14. NR TEI | 14-8 | CSI trigger states containing non-active BWP | 1. CSI trigger states containing non-active BWP
 |  | Yes | N/A |  | Per UE | No | No | N/A | Agreements:TEI – “CSI trigger states containing non-active BWP”・When a UE is triggered with a CSI report for a DL BWP that is non-active, the UE is not expected to report the CSI for the non-active BWP and the CSI report associated with the BWP is omitted.・When a UE is triggered with aperiodic CSI-RS in a DL BWP that is non-active, the UE is not expected to measure the aperiodic CSI-RS. ・The above non-active BWP is the non-active BWP when receiving the associated CSI-RS with the following relaxation for UE processing. In the CC of the associated CSI-RS, if the active BWP when receiving the CSI-RS is different from the active BWP when receiving the triggering DCIThe last symbol of the PDCCH span of the DCI carrying the BWP switching shall be no later than the last symbol of the PDCCH span of the CSI trigger DCI, irrespective of whether they are in the same CC or not and irrespective of whether they are in the same SCS or not.The UE is not expected to have any other BWP switching in that CC after the last symbol of the PDCCH span covering CSI trigger DCI and before the first symbol of the triggered CSI-RS resource.・Note: the UE is not required to measure P/SP-CSI-RS in the non-active BWP per current specification | [Mandatory or Optional] with capability signaling |