**3GPP TSG-RAN WG2 Meeting #117 electronic R2-22**

**Online, February 21 – March 3, 2022**

**Agenda item: 8.24.1**

**Source: CMCC**

**Title: [AT117-e][056][NR17] FR1 HST (CMCC)**

**WID/SID: NR\_HST\_FR1\_enh**

**Document for: Discussion and Decision**

# Introduction

This document aims at address the remaining details for slice groups

**[AT117-e][056][NR17] FR1 HST (CMCC)**

Scope: Treat R2-2202171, R2-2202157, R2-2202869, R2-2202870. Ph1 Determine agreeable parts and converge on discussion points if any, Ph2 agree CRs (and Reply LS only if needed).

Intended outcome: Report, Agreed CR 38331, endorsed UE cap CRs (or draft CRs) (38306, 38331) for Merge.

Phase 1: companies share comments in offline discussion paper. And rapporteur will update the CRs.

Phase 1 deadline: W1 Thur Feb 24th 1200 UTC

Phase 2: final check the updated CRs and agree/endorse the CRs.

Phase 2 deadline: W2 Wed March 2nd 1200 UTC

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|  |  |  |
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# Discussion

RAN4 sent two new LSes for FR1 HST to introduce CA demodulation and inter-frequency measurement in connected state.

R2-2202171 LS on signaling for FR1 HST CA demodulation (R4-2202984; contact: CMCC) RAN4 LS in Rel-17 To:RAN2

R2-2202157 LS on signalling for inter-frequency measurement enhancement in connected state for FR1 HST (R4-2202591; contact: CMCC) RAN4 LS in Rel-17 To:RAN2

The in-principle-agreed CRs are revised to the following CRs to implement the new LSes, with correction made by name of ‘R2-2202171’ and ‘R2-2202171’.

R2-2202869 Introduction of RRM enhancements for Rel-17 NR FR1 HST CMCC, Ericsson, Huawei, Nokia, Qualcomm CR Rel-17 38.331 16.7.0 2898 1 B NR\_HST\_FR1\_enh R2-2202630

R2-2202870 Introduction of RRM enhancements for Rel-17 NR FR1 HST CMCC, Ericsson, Huawei, Nokia, Qualcomm CR Rel-17 38.306 16.7.0 0683 1 B NR\_HST\_FR1\_enh R2-2202631

The intended outcomes for this email discussion are agreed CR 38331, endorsed UE cap CRs (or draft CRs) (38306, 38331) for Merge. Therefore, the 331 CR in R2-2202869 is divided into two 331CRs, one for function and one for capability.

The CRs are now available in the same draft folder for review, including the 331CR for function, 331CR for capability and 306CR for capability

## Demodulation enhancement function for CA

In R2-2202171 (R4-2202984), RAN4 sent the following information for FR1 HST CA demodulation:

* RAN4 notices that the IE *highSpeedDemodFlag-r16* is signalled per serving cell basis in both *ServingCellConfigCommonSIB* and *ServingCellConfigCommon*, however the Rel-16 HST WI only considers single carrier scenario. The enhancement of CA requirements is under discussion in Rel-17 NR FR1 HST, and RAN4 agreed that network needs to inform UE whether to apply the enhanced PDSCH requirements for CA specified in TS38.101-4. The signalling design is up to RAN2
* For the enhanced demodulation requirements for CA in HST, RAN4 has agreed to introduce a new UE capability for HST SFN CA. The UE capability is to indicate whether the UE is capable of demodulation processing for HST SFN CA in FR1, as specified in TS 38.101-4.

**Changes in 38.331 functional CR:**

**In the 38.331CR, *highSpeedDemodCA-Scell-r17* is introduced in *HighSpeedConfig-v17xy*. And applied with the following description.**

|  |
| --- |
| ***HighSpeedDemodCA-Scell***  **If the field is present , the UE shall apply the enhanced demodulation processing for HST-SFN joint transmission scheme with velocity up to 500km/h as specified in TS 38.101-4 [59]. This parameter only applies to SCell.** |

**Q1: Do you agree with the above signalling and field description?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or not?** | **Comments** |
| Huawei, HiSilicon | Agree with comments | UE capability needs to be reflected in the field description.  **If the field is present and UE supports *demodulationEnhancementCA-r17*, the UE shall apply the enhanced demodulation processing for HST-SFN joint transmission scheme with velocity up to 500km/h as specified in TS 38.101-4 [59]. This parameter only applies to SCell.**  Similarly, some update on the Rel-16 field *highSpeedDemodFlag* is needed. |
| CMCC Rapp |  | Huawei’s comment seems valid to me. And I am also open to see companies’ views.  Another thing I need to mention is that, RAN2 has already achieved the following agreements in RAN2#116-e:   * RAN2 should only implement the feature groups from the RAN1 and 4 feature list without any FFS (no highlighted yellow, [] and marked as FFS/TBD) into the CRs. Also Caps that are dependent on FFS Caps should not be implemented.   As there is still [] for *demodulationEnhancementCA-r17* on [per band combination] in RAN4 feature list R4-2202400. So it would be safe to remove this capability from both 38.331CR and 38.306CR for now.  This will be implemented in the CRs with suffix “\_v01\_Rapp”, which can be found in the sub-folder named by “CRs”. |
| Nokia | Agree | This would be fine and also it would be OK to reflect UE capability as indicated by Huawei. |
| Intel | agree | We are also fine to add UE cap info suggested by HW |
| Ericsson | Agree | HW's modification is also OK. |
| vivo | agree | Fine with the current version as NW will only config this field to the UE with the capability. |
| Samsung | Agree | We are also fine with Huawei's update. |
| CATT | Agree | Ok with Huawei’s update. |
| ZTE | Agree | We are also fine with Huawei's update. |
| Apple | Agree | We are fine with the Huawei’s update. |
| Qualcomm | Agree | Fine with HW revision |
| LGE | Agree |  |

Summary for 2.1:

All companies agree with Huawei’s update. So that will be implemented in the CRs.

**Proposal 1: The following corrections are applied to 38.331 CR for HST function:**

* **Add “and UE supports *demodulationEnhancementCA-r17*” to the field description for *highSpeedDemodCA-Scell-r17.***
* **Add “and UE supports *demodulationEnhancement-r16*” to the field description for *highSpeedDemodFlag-r16*.**

## Demodulation enhancement capability for CA

**Changes for 38.331 capability CR and 38.306 CR:**

**According to RAN4 LSin, RAN2 needs to introduce capability signalling *demodulationEnhancementCA-r17* in *HighSpeedParameters-v17xy* in *UE-NR-Capability* in 38.331 capability CR, and capture the following description in 306CR.**

| ***demodulationEnhancementCA-r17***  **Indicates whether the UE supports the enhanced demodulation processing for carrier aggregation for HST-SFN joint transmission scheme with velocity up to 500km/h as specified in TS 38.101-4 [18].** | **[BC]** | **No** | **No** | **FR1 only** |
| --- | --- | --- | --- | --- |

One thing needs to mention is that, in RAN4 UE feature list for NR (R4-2202400), support of enhanced Demodulation requirements for CA is [per band combination]. Rapporteur suggests we keep align with the RAN4 UE feature list for now, and can be updated or remove the bracket after further input from RAN4.

**Q2: Do you agree with the above capability signalling *demodulationEnhancementCA-r17* and capability description?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or not?** | **Comments** |
| Huawei, HiSilicon | Agree |  |
| Nokia | Agree |  |
| Intel | Agree |  |
| Ericsson | Agree |  |
| vivo | Agree |  |
| Samsung | Agree | - |
| CATT | Agree |  |
| ZTE | Agree |  |
| Apple | Agree |  |
| Qualcomm | Agree |  |
| LGE | Agree |  |

All companies agree with the capability signalling for *demodulationEnhancementCA-r17*.

And according to the latest RAN4 UE feature list, the bracket for [per band combination] is removed. So the RAN2 capability CRs are updated accordingly.

**Proposal 2: The following change is applied to 38.306 capability CR:**

* **the bracket in [per band combination] for *demodulationEnhancementCA-r17* is removed.**

## Inter-frequency measurement enhancement signalling for CA

R2-2202157 (R4-2202591), RAN4 sent the following information for inter-frequency measurement enhancement in CONNECTED mode:

* For connected mode, RAN4 agrees to introduce a cell specific network signalling to inform UE whether to apply the enhanced RRM requirements for inter-frequency measurement specified in TS38.133 (the signalling is different from the network signalling for CA enhancement). The signalling design is up to RAN2

**So, RAN2 need to introduce *highSpeedMeasInterFreq-r17* in *HighSpeedConfig-v17xy*. And applied with the following description.**

|  |
| --- |
| ***highSpeedMeasInterFreq***  **If the field is present and UE supports *measurementEnhancementInterFreq-r17*, the UE shall apply the enhanced RRM requirements for inter-frequency measurement in RRC\_CONNECTED to support high speed up to 500 km/h as specified in TS 38.133 [14].** |

Please note that the capability signalling is already capatured in the IPA CR based on the former LSin in RAN2#116bis-e.

**Q3: Do you agree to introduce the IE *highSpeedMeasInterFreq-r17* and the above field description?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or not?** | **Comments** |
| Huawei, HiSilicon | Agree |  |
| Nokia | Agree |  |
| Intel | Agree |  |
| Ericsson | Agree |  |
| vivo | Agree |  |
| Samsung | Agree | - |
| CATT | Agree |  |
| ZTE | Agree |  |
| Apple | Agree |  |
| Qualcomm | Agree |  |
| LGE | Agree |  |

All companies agreed. So no additional change is needed for current CRs.

## Restriction in the field description on the applicability for SpCell or SCell

One thing needs to check with companies is that, we use the phrase “The network does not configure this field to **SCell**” in the field description for R16 IE *highSpeedMeasFlag-r16* and *highSpeedDemodFlag-r16* in current 331CR, as well as the new R17 HST IEs.

The *HighSpeedConfig-r16* is in both *ServingCellConfigCommon* (dedicated signaling) and *ServingCellConfigCommonSIB* (SIB1). While the *HighSpeedConfig-v17xy* only presents in *ServingCellConfigCommon* (dedicated signaling), as the R17 HST IEs in *HighSpeedConfig-v17xy* are only applicable for CONNECTED mode.

During offline, one company commented that, “SCell” is a UE dedicated configuration. Therefore, for *HighSpeedConfig-r16*, saying that NW does not configure the IE for SCell in SIB1 is strange since the cell can be PCell for another UE and the NW broadcasts only on SIB1. And Company pointed out that RAN2 has agreed that the network is allowed to configure the cell-specific specific configuration in the same way between dedicated signalling and SIB1 and the UE can ignore configurations that are not applicable. This was the outcome of the long debate on handling of *ServingCellConfigCommon* and *ServingCellConfigCommonSIB*.

**So it was suggested to change the description from “The network does not configure this field to SCell” to “This parameter only applies to SpCell.”**

From rapporteur point of view, the new description looks safer. In case network configures this IE to SCell by mistake, UE can just ignore that wrong configuration signalling, rather than UE occurs error or considers the gNB as illegal.

**Therefore, Rapporteur would like to check companies’ views whether we can use following field description:**

* **The field description of *HighSpeedConfig-r16* and *highSpeedDemodFlag-r16* is changed from “The network does not configure this field to SCell” to “This parameter only applies to SpCell.”**
* **The field description of *highSpeedMeasCA-Scell-r17* and *highSpeedDemodCA-Scell-r17* captures that “This parameter only applies to SCell.”**

**Q4: Do you agree with the above wording in the field description?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or not?** | **Comments** |
| Huawei, HiSilicon | Agree |  |
| Nokia | Agree |  |
| Intel | Agree |  |
| Ericsson | Agree |  |
| vivo | Agree |  |
| Samsung | Agree | - |
| CATT | Agree |  |
| ZTE | Agree |  |
| Apple | Agree |  |
| Qualcomm | Agree |  |
| LGE | Agree |  |

All companies agreed. So no additional change is needed for current CRs.

## Others

**Q5: Any other issue for the CRs in the folder?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| vivo | The following IE names are not aligned with that in the cover sheet.   * a per-UE capability indication has been added that indicates whether the UE is capable of supporting the enhanced RRM requirements for CA. This capability indication has been named *measurementEnhancementCA-Scell* and has been added to the new IE *HighSpeedParameters-r17*. * a per-UE capability indication has been added that indicates whether the UE is capable of supporting the enhanced RRM requirements for inter-frequency measurements. This capability indication has been named *measurementEnhancementInter-Freq* and has been added to the new IE *HighSpeedParameters-r17*.   measurementEnhancementCA-r17 ENUMERATED {supported},  measurementEnhancementInterFreq-r17 ENUMERATED {supported}, |
| CMCC Rapp | Thank vivo for pointing out the error. I have updated the wording in cover page to align with the capability signalling IE. Please find the updated “331CR on capability for FR1 HST\_v02\_Rapp3” in the “CRs” folder. |
|  |  |
|  |  |

A new update from RAN4 is that, RAN4 has agreed that both R17 RRM enhancement for HST and demodulation enhancement for HST are release independent and can be early implemented in Rel-16. So the coversheet for the CRs are updated to capture the early implementation description. And the 38.331 CR also add the Annex C to list the 38.331 CR for early implementation.

**Proposal 3: RAN4 has agreed that both R17 RRM enhancement for HST and demodulation enhancement for HST are release independent and can be early implemented in Rel-16. So the following changes are applied:**

* **the coversheets for the CRs are updated to capture “this CR can be early implemented by Rel-16 UEs.”**
* **the 38.331 CR is added with the Annex C to list the 38.331 CR for early implementation.**

# Summary

Here are the conclusion for this offline discussion.

**Proposal 1: The following corrections are applied to 38.331 CR for HST function:**

* **Add “and UE supports *demodulationEnhancementCA-r17*” to the field description for *highSpeedDemodCA-Scell-r17.***
* **Add “and UE supports *demodulationEnhancement-r16*” to the field description for *highSpeedDemodFlag-r16*.**

**Proposal 2: The following change is applied to 38.306 capability CR:**

* **the bracket in [per band combination] for *demodulationEnhancementCA-r17* is removed.**

**Proposal 3: RAN4 has agreed that both R17 RRM enhancement for HST and demodulation enhancement for HST are release independent and can be early implemented in Rel-16. So the following changes are applied:**

* **the coversheets for the CRs are updated to capture “this CR can be early implemented by Rel-16 UEs.”**
* **the 38.331 CR is added with the Annex C to list the 38.331 CR for early implementation.**

# References

1. R2-2202171 LS on signaling for FR1 HST CA demodulation (R4-2202984; contact: CMCC) RAN4 LS in Rel-17 To:RAN2
2. R2-2202157 LS on signalling for inter-frequency measurement enhancement in connected state for FR1 HST (R4-2202591; contact: CMCC) RAN4 LS in Rel-17 To:RAN2
3. R2-2202869 Introduction of RRM enhancements for Rel-17 NR FR1 HST CMCC, Ericsson, Huawei, Nokia, Qualcomm CR Rel-17 38.331 16.7.0 2898 1 B NR\_HST\_FR1\_enh R2-2202630
4. R2-2202870 Introduction of RRM enhancements for Rel-17 NR FR1 HST CMCC, Ericsson, Huawei, Nokia, Qualcomm CR Rel-17 38.306 16.7.0 0683 1 B NR\_HST\_FR1\_enh R2-2202631
5. R2-2202630 Introduction of RRM enhancements for Rel-17 NR FR1 HST CMCC, Ericsson, Huawei, Nokia CR Rel-17 38.331 16.7.0 2898 - B NR\_HST\_FR1\_enh Revised

*Was previously agreed-in-principle. Now revised*

1. R2-2202631 Introduction of RRM enhancements for Rel-17 NR FR1 HST CMCC, Ericsson, Huawei, Nokia CR Rel-17 38.306 16.7.0 0683 - B NR\_HST\_FR1\_enh Revised

*Was previously agreed-in-principle. Now revised*