**3GPP TSG-RAN WG2 Meeting #117 electronic R2-2202870**

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

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  |  | **CR** | **0683** | **rev** | **1** | **Current version:** | **0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Introduction of RRM enhancements for Rel-17 NR FR1 HST |
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| ***Source to WG:*** | CMCC, Ericsson, Huawei, Nokia, Qualcomm |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_HST\_FR1\_enh |  | ***Date:*** | 2022-02-21 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | R17 HST capabilities are captured in RAN4 feature list in R4-2202400. As per the Rel-17 work item RRM enhancements for Rel-17 NR FR1 HST the network should be able to enable/disable RRM measurement enhancements for FR1 high-speed train scenarios. RAN4 has agreed the following:*Rev 0 (Add features according to RAN4 LSin R4-2120286 at RAN2#116bis-e)*For CA enhancement:* the network needs to be able to inform UE whether to apply the enhanced RRM requirements for CA specified in TS38.133
* a per-UE capability is needed which indicates whether the UE is capable of supporting the enhanced RRM requirements for CA in Rel-17

For inter-frequency measurement enhancement:* for idle mode, network signalling should be added to inform the UE whether the enhanced inter-frequency HST measurement requirements are applied per each inter-frequency carrier
* a per-UE capability is needed which indicates whether the UE is capable of supporting the enhanced RRM requirements for inter-frequency measurement for connected mode
* the support of HST idle mode inter-frequency measurement enhancements is an optional UE feature without capability signalling.

*Rev 1 (Add features according to RAN4 LSin R4-2202591 and R4-2202984 at RAN2#117-e)*For demodulation enhancement: * introduce a new UE capability For the enhanced demodulation requirements for CA in HST SFN.
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| ***Summary of change:*** | *Rev 0 (Add features according to RAN4 LSin R4-2120286 at RAN2#116bis-e)*For CA enhancement:* 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* and has been added to High speed parameters.

For inter-frequency measurement enhancement:* 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 High speed parameters.
* high speed inter-frequency measurements in RRC\_IDLE / RRC\_INACTIVE has been added as an optional feature without capability signalling

*Rev 1 (Add features according to RAN4 LSin R4-2202591 and R4-2202984 at RAN2#117-e)*For demodulation enhancement: * For the enhanced demodulation requirements for CA in HST, introduce a new UE capability for HST SFN CA.
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| ***Consequences if not approved:*** | RRM enhancements for Rel-17 NR FR1 HST is not supported in 38.306. |
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| ***Clauses affected:*** | 4.2.19, 5.6 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.331 CR 2898 |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** | This CR should be lifted to the latest version of the specification before approval.This CR can be early implemented by Rel-16 UEs. |
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| ***This CR's revision history:*** |  |

*FIRST CHANGE*

### 4.2.19 High speed parameters

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***measurementEnhancement-r16***Indicates whether the UE supports the enhanced intra-NR and inter-RAT E-UTRAN RRM requirements to support high speed up to 500 km/h as specified in TS 38.133 [5]. This field applies to MN configured measurement enhancement when MR-DC is not configured and SN configured measurement enhancement when (NG)EN-DC is configured. | UE | No | No | FR1 only |
| ***measurementEnhancementCA-r17***Indicates whether the UE supports the enhanced RRM requirements for carrier aggregation to support high speed up to 500 km/h as specified in TS 38.133 [5].  | UE | No | No | FR1 only |
| ***measurementEnhancementInterFreq-r17***Indicates whether the UE supports the enhanced RRM requirements for inter-frequency measurements in connected mode to support high speed up to 500 km/h as specified in TS 38.133 [5]. | UE | No | No | FR1 only |
| ***demodulationEnhancement-r16***Indicates whether the UE supports the enhanced demodulation processing for HST-SFN joint transmission scheme with velocity up to 500km/h as specified in TS 38.101-4 [18]. This field applies to MN configured demodulation enhancement when MR-DC is not configured and SN configured demodulation enhancement when (NG)EN-DC is configured. | UE | No | No | FR1 only |
| ***intraNR-MeasurementEnhancement-r16***Indicates whether the UE supports the enhanced intra-NR RRM requirements to support high speed up to 500 km/h as specified in TS 38.133 [5]. This field applies to MN configured measurement enhancement when MR-DC is not configured and SN configured measurement enhancement when (NG)EN-DC is configured.The UE can include this field only if the UE does not indicate the support of *measurementEnhancement-r16* and *interRAT-MeasurementEnhancement-r16*. Otherwise, the UE does not include this field. | UE | No | No | FR1 only |
| ***interRAT-MeasurementEnhancement-r16***Indicates whether the UE supports the enhanced inter-RAT E-UTRAN RRM requirements to support high speed up to 500 km/h as specified in TS 38.133 [5]. This field applies to MN configured measurement enhancement.The UE can include this field only if the UE does not indicate the support of *measurementEnhancement-r16* and *intraNR-MeasurementEnhancement-r16*. Otherwise, the UE does not include this field. | UE | No | No | FR1 only |
| ***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 |

*NEXT CHANGE*

# 5 Optional features without UE radio access capability parameters

**/\*Partially omitted\*/**

## 5.6 RRM measurement features

| Definitions for feature |
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| **High speed inter-frequency IDLE/INACTIVE measurements**It is optional for UE to support high speed inter-frequency measurements in RRC\_IDLE/RRC\_INACTIVE as specified in TS 38.133 [5]. |
| **Relaxed measurement**It is optional for UE to support relaxed RRM measurements of neighbour cells in RRC\_IDLE/RRC\_INACTIVE as specified in TS 38.304 [21]. |

*CHANGE END*