**3GPP TSG-RAN WG4 Meeting # 99-e R4-210XXXX**

**Electronic Meeting, May. 19-27, 2021**

**Agenda item:** 9.7.2

**Source:** Moderator (CMCC)

**Title:** Email discussion summary for [99-e] [222] NR\_HST\_FR1\_enh\_RRM

**Document for:** Information

# Introduction

This email discussion focuses on RRM for Rel-17 NR FR1 HST, and in particular the agenda items:

9.7.2 RRM core requirements

9.7.2.1 UE RRM core requirements for CA scenario

9.7.2.1.1General

9.7.2.1.2 Intra-frequency measurements

9.7.2.1.3 Inter-frequency measurements

The targets of email discussion for 1st round and 2nd round are:

* 1st round: focus on discussing the open issues and strive to minimize the open issues
* 2nd round: according to 1st round discussion, discuss left open issues for 2nd round, and strive to minimize the open issues.

# Topic #1: intra-frequency measurements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109062**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109062.zip) | CATT | **Proposal 1: Add additional note can be added in Table 9.2.5.1-1, Table 9.2.5.1-3, Table 9.2.5.2-5, Table 9.2.6.2-1, Table 9.2.6.2-3, Table 9.2.6.3-3 as “NOTE: When RRM enhancement for high speed is configured for CA, the requirements apply to measurements of a secondary component carrier with active SCell.”****Proposal 2: For deactivated SCell, reuse similar principle as Rel-16 HST and add additional note for SCells in such requirements.****Proposal 3: For deactivated SCell Kp issue, it is reasonable to keep Kp. But it’s better to conclude Kp for non-HST firstly.** |
| [**R4-2109248**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109248.zip) | Xiaomi | **Proposal 1：It is proposed not to enhance the NSCC\_SSB in R17 HST WI.****Proposal 2：Kp requirements modifications shall be discussed in R17 HST after the corresponding issue concluded in R15 and R16.** |
| [**R4-2109316**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109316.zip) | Apple | **Proposal 1: enhancement on NSCC\_SSB for high speed scenario implies change in measurement strategy, which is not necessary since measurement on deactivated SCC is being enhanced in terms of adding new scaling factor M2, Y and so on.****Proposal 2: Kp is needed for deactivated SCC measurement.****Proposal 3: to avoid duplicated discussion, Kp issue can be discussed in R15 maintenance. Some conclusion can apply here for R17 FR1 HST enhancement.** |
| [**R4-2109516**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109516.zip) | CMCC | *Observation 1: based on RAN4 common understanding on the current non-HST specification, For CSSFoutside\_gap,i, both SCell(s) measured without MG and SCell(s) measured with MG are counted in NSCC\_SSB.**Observation 2: there is over counted issue on the SCell(s) measured with MG, which are calculated in both CSSFwithin\_gap,i and CSSFoutside\_gap,i**Observation 3: high speed train scenario will support the high velocity up to 500km/h, which is more sensitive to the measurement delay. The unnecessary delay introduced by over counted issue on NSCC\_SSB for the calculation of CSSFoutside\_gap,i need to be updated/revised in order to improve the measurement performance.****Proposal 1: for high speed train scenario, it is proposed that only SCell(s) measured without MG are counted in NSCC\_SSB for the calculation of CSSFoutside\_gap,i.*** |
| [**R4-2109634**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109634.zip) | MediaTek inc. | **Proposal 1: Scaling factor Kp should be introduced in PSS/SSS detection, time index detection and measurement requirement for deactivated SCells in HST and non-HST.** |
| [**R4-2110220**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110220.zip) | Ericsson | ***Proposal 1: L1-SINR was introduced in Rel-16 eMIMO, we should wait conclusion in Rel-16 HST. We’re OK to use Ês/Iot ≤5 dB from SS-SINR in L1-SINR for CMR case.*** |

## Open issues summary

### Sub-topic 1-1 NSCC\_SSB for CSSFoutside\_gap,i

**Issue 1-1: NSCC\_SSB for CSSFoutside\_gap,i**

|  |
| --- |
| **Background (R4-2105793):*** + Enhancement on CSSFoutside\_gap,i for SCell measurement
		- RAN4 has the following common understanding of the current non-HST specification:
			* For CSSFoutside\_gap,i, both SCell(s) measured without MG and SCell(s) measured with MG are counted in NSCC\_SSB.
				+ Both activated and deactivated SCells are included
		- FFS the enhancement on NSCC\_SSB for high speed scenario
 |

* Proposals
	+ Option 1 (Nokia): NSCC\_SSB enhancements should cover non-HST as well as HST
	+ Option 2 (vivo): Further discuss the issue of CSSFoutside\_gap issue under TEI16
	+ Option 3 (Xiaomi): It is proposed not to enhance the NSCC\_SSB in R17 HST WI
	+ Option 4 (Apple): enhancement on NSCC\_SSB for high speed scenario implies change in measurement strategy, which is not necessary since measurement on deactivated SCC is being enhanced in terms of adding new scaling factor M2, Y and so on
	+ Option 5 (CMCC): for high speed train scenario, it is proposed that only SCell(s) measured without MG are counted in NSCC\_SSB for the calculation of CSSFoutside\_gap,i
* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 1-1: NSCC\_SSB for CSSFoutside\_gap,i** |
| **Company** | **Comments** |
| XXX |  |
| Huawei | Share the similar view with option 4 and option 5. Changing the CSSF table will impact implementation strategy. |

### Sub-topic 1-2 Kp

**Issue 1-2: Kp for deactivated Scell measurement**

* Proposals
	+ Option 1 (QC, HW, Apple, MTK): Kp shall also apply for measurement requirements on deactivated SCell in R17 FR1 HST, where Kp = 1/(1- (SMTC period /MGRP))
	+ Option 2 (Ericsson, Xiaomi): Kp requirements modifications shall be discussed in R17 HST after the corresponding issue concluded in R15 and R16
	+ Option 3 (vivo, CATT, Apple): Rel-15/Rel-16 Kp requirements modification (if any) shall also apply for R17 HST
* Recommended WF
	+ To avoid duplicated discussion, could we agree that Kp requirements modifications will be discussed in R17 HST after the corresponding issue concluded in R15/R16.

|  |
| --- |
| **Issue 1-2: Kp for deactivated Scell measurement**  |
| **Company** | **Comments** |
| Huawei | Support option 1. The issue has been discussed for three meetings. The enhancement on deactivated SCell in R17 HST WI shall be based on correct requirements. Kp modification shall also apply for R17 HST to keep consistence. |
|  |  |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic #1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Topic #2: inter-frequency measurements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109063**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109063.zip) | CATT | **Proposal 1: Enhancements for RRC IDLE are needed for inter-frequency measurements. The intra-frequency for Rel-16 HST enhancement can be used as a baseline. The decreased number of samples and Kcarrier should be considered as well.****Proposal 2: Enhancements for RRC\_CONNECTED are needed for inter-frequency measurements. M2 defined in Rel-16 HST is reused. The requirements can be set as Table 1~Table 6.****Table 1: Time period for PSS/SSS detection (Frequency range FR1)**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX |  Max(600ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8\*M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

**Table 2: Time period for time index detection (Frequency range FR1)**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

**Table 3: Measurement period for inter-frequency measurements with gaps (Frequency FR1)**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 160ms | Max(200ms, Ceil(8 × M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| 160ms < DRX cycle≤ 320ms | Max(200ms, Ceil(7 × M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

Without measurement gaps:Table 4: Time period for PSS/SSS detection, (FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

Table 5: Time period for time index detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_intra |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

Table 6: Measurement period for inter-frequency measurements with gaps ((FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 160ms | max(200ms, ceil(M2x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| 160ms < DRX cycle≤ 320ms | max(200ms, ceil(M2x 4 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil( 5 x Kp ) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

 |
| [**R4-2109249**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109249.zip) | Xiaomi | **Proposal 1: For inter-frequency measurement without MG, the same enhancement for intra-frequency measurement without MG in R16 HST could be reused.****Proposal 2: For inter-frequency measurement with MG, the enhanced strategy for E-UTRAN TDD/FDD – NR measurements in R16 HST could be used as baseline.****Proposal 3: RAN4 to define the idle mode inter-frequency measurement enhancements for R17 FR1 HST.****Proposal 4: The R16 enhanced EUTRA-NR inter-RAT measurement requirements in idle mode could be reused for NR inter-frequency measurements.** |
| [**R4-2109317**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109317.zip) | Apple | **Proposal 1: NW shall indicate which inter-frequency layers need to be measured more often, for which enhanced inter-frequency measurement requirements shall apply.****Proposal 2: enhancement on inter-frequency measurement in connected mode can be:****Table 9.3.4-1: Time period for PSS/SSS detection (Frequency range FR1)**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX |  Max(600ms, [6] × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil([6]\*M2NOTE 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | [6] × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When [*highSpeedMeasFlag-r17*] is not configured, M2 = 1.5; When [*highSpeedMeasFlag-r17*] is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

**Table 9.3.4-3: Time period for time index detection (Frequency range FR1)**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2NOTE 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When [*highSpeedMeasFlag-r17*] is not configured, M2 = 1.5; When [*highSpeedMeasFlag-r17*] is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

**Table 9.3.5-1: Measurement period for inter-frequency measurements with gaps (Frequency FR1)**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, [6] × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil([6] × M2NOTE 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | [6] × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When [*highSpeedMeasFlag-r17*] is not configured, M2 = 1.5; When [*highSpeedMeasFlag-r17*] is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

**Observation 1: no significant degradation is observed if idle mode inter-frequency requirements are not enhanced.****Proposal 3: enhancement on idle mode inter-frequency is unnecessary.** |
| [**R4-2109515**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109515.zip) | CMCC | ***Proposal 1: for connected state inter-frequency measurement without MG, it is proposed to reuse intra-frequency measurement enhancement for HST, and the details are shown as following:**** ***for PSS/SSS detection delay requirements, M2 is reused***
* ***for time index detection delay requirements, M2 is reused***
* ***for measurement, M2 and Y is reused***

Measurement period for inter-frequency measurements without gaps ((FR1)

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_intra  |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 160ms | max(200ms, ceil(M2 Note 2 x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| 160ms < DRX cycle≤ 320ms | ceil(4 x M2 Note 2 x Kp) x max(SMTC period,DRX cycle) |
| DRX cycle>320ms | ceil(Y Note 3 x Kp ) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 3: Y= 3 when SMTC <= 40ms, Y= 5 when SMTC > 40ms |

***Proposal 2: for connected state inter-frequency measurement with MG, it is proposed to take intra-frequency measurement enhancement for HST as baseline, and the details are shown as following:**** ***for PSS/SSS detection delay requirements, M2 is reused***
* ***for time index detection delay requirements, M2 is reused***
* ***for measurement, M2 is reused, Y is introduced and the value of Y can be further discussed***

**Measurement period for inter-frequency measurements with gaps (Frequency FR1)**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle≤ 160ms | Max(200ms, Ceil(8 × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| 160ms <DRX cycle ≤ 320ms | Max(200ms, Ceil([4] × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Y Note 4 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 4: Y1= [3] when SMTC <= 40ms, Y1= [8] when SMTC > 40ms |

***Proposal 3: it is proposed to define enhancement on RRC IDLE state inter-frequency measurement.******Proposal 4: the enhancement specified for intra-frequency enhancement in Rel-16 HST WI can be used as baseline to specify the enhanced requirements for inter-frequency measurement in idle mode.******Proposal 5: it is proposed to introduce a new UE capability to indicate whether the inter-frequency measurement enhancement with velocity up to 500 km/h is supported or not.******Proposal 6: If it is agreed to introduce UE capability for HST CA, it is necessary to discuss whether a single UE capability can cover both CA enhancement and inter-frequency measurement enhancement.*** |
| [**R4-2109635**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109635.zip) | MediaTek inc. | **Proposal 1: In CONNECTED mode, the inter-frequency measurements with MGs for Rel-17 HST may follow the similar logic as the R16 HST inter-RAT measurement (from LTE to NR) defined in clause 8.1.2.4.21 of TS 36.133, i.e., introduce the scaling factor M2, to define the requirement.****Proposal 2: In CONNECTED mode, for the inter-frequency measurements with MGs in Rel-17 HST, the TPSS/SSS\_sync\_inter should be:**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX |  Max(600ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8\* M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When RRM enhancement for high speed is not configured, M2 = 1.5; When RRM enhancement for high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

**Proposal 3: In CONNECTED mode, for the inter-frequency measurements with MGs in Rel-17 HST, the TSSB\_time\_index\_inter should be:**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When RRM enhancement for high speed is not configured, M2 = 1.5; When RRM enhancement for high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

**Proposal 4: In CONNECTED mode, for the inter-frequency measurements with MGs in Rel-17 HST, the TSSB\_measurement\_period\_inter** **should be:**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 4 × M2 Note 3× DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When RRM enhancement for high speed is not configured, M2 = 1.5; When RRM enhancement for high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

**Proposal 5: In CONNECTED mode, the inter-frequency measurements without MGs for Rel-17 HST may follow the same logic as the R16 HST intra-frequency measurement, i.e., introduce the scaling factor M2 and Y, to define the requirement.****Proposal 6: In CONNECTED mode, for the inter-frequency measurements without MGs in Rel-17 HST, the TPSS/SSS\_sync\_inter should be:**

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2 Note 2 x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When RRM enhancement for high speed is not configured, M2 = 1.5; When RRM enhancement for high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

**Proposal 7: In CONNECTED mode, for the inter-frequency measurements without MGs in Rel-17 HST, the TSSB\_time\_index\_inter should be:**

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_inter |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 Note 2 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When RRM enhancement for high speed is not configured, M2 = 1.5; When RRM enhancement for high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

**Proposal 8: In CONNECTED mode, for the inter-frequency measurements without MGs in Rel-17 HST, the TSSB\_measurement\_period\_inter** **should be:**

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_inter  |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 160ms | max(200ms, ceil(M2 Note 2 x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| 160ms < DRX cycle≤ 320ms | ceil(M2 Note 2 x 4 x Kp) x max(SMTC period,DRX cycle))x CSSFinter |
| DRX cycle>320ms | ceil(Y Note 3 x Kp ) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 3: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms |

**Proposal 9: In IDLE mode, the inter-frequency measurements should be up to UE capability.****Proposal 10: In IDLE mode, the inter-frequency measurements for Rel-17 HST may follow the similar logic as the R16 HST inter-RAT measurement (from LTE to NR) defined in clause 4.2.2.5.6 of TS 36.133, i.e., introduce the scaling factor M2, M3 and M4, to define the requirement.****Proposal 11: In IDLE mode, for the inter-frequency measurements in Rel-17 HST, the Tdetect,NR\_Inter, Tmeasure,NR\_Inter and Tevaluate,NR\_Inter should be:**

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR\_Inter [s] (number of DRX cycles) | Tmeasure,NR\_Inter [s] (number of DRX cycles) | Tevaluate,NR\_Inter [s] (number of DRX cycles) |
|  |
| 0.32 | 4.16 x M2 (13 x M2)Note 1 | 0.64 x M3 (2 x M3)Note 1 | 0.96 x M4 (3 x M4) Note 1 |  |
| 0.64 | 7.68 (12)) | 1.28 (2) | 1.92 (3) |  |
| 1.28 | 12.8(10)  | 1.28 (1) | 3.84 (3) |  |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |  |
| Note 1: M2=1.5, M3=2 and M4=2 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M2=M2=M3=1. |  |

 |
| [**R4-2110219**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110219.zip) | Ericsson | ***Proposal 1:*** ***RRC IDLE inter-frequency measurements are needed. As the case exists, enhancement is needed same as R16 for Intra-frequency measurements.*** |
| [**R4-2111256**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111256.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: For HST, the inter-frequency measurements in connected mode are enhanced according to Tables 1-3.** **Table 1: Time period for PSS/SSS detection (Frequency range FR1) for HST**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX |  Max(600ms, N Note 4 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(N Note 4\* M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | N Note 4 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.NOTE 4: When *highSpeedMeasFlag-r16* is not configured, N = 8; otherwise N = 5. |

**Table 2: Time period for time index detection (Frequency range FR1) for HST**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2 Note 3 ) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1 |

**Table 3: Measurement period for inter-frequency measurements with gaps (Frequency FR1) for HST**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 5 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle≤ 160ms | Max(200ms, Ceil(5 × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| 160 ms ≤DRX cycle ≤ 320ms | 4 × M2 Note 3× DRX cycle × CSSFinter |
| DRX cycle > 320ms |  Y Note 4 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1NOTE 4: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms |

*Observation* 1: It is not clear whether idle mode inter-frequency measurements are needed, considering it increases battery energy consumption of UE. |

## Open issues summary

|  |
| --- |
| **Background (R4-2105793):*** Inter-frequency measurement
	+ Define RRC Connected state inter-frequency measurement enhancements
		- Support of HST inter-frequency measurement enhancements is up to UE capability. Details are FFS
	+ FFS whether enhancements for RRC IDLE inter-frequency measurements are needed
 |

### Sub-topic 2-1: inter-frequency measurement in idle state

**Issue 2-1: whether define the enhancement for inter-frequency measurement in idle mode for HST**

* Proposals
	+ Option 1 (QC, vivo, CATT, CMCC, Xiaomi, Ericsson): Yes
	+ Option 2 (Apple): No
	+ Option 3 (MTK): up to UE capability
* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 2-1: whether define the enhancement for inter-frequency measurement in idle mode for HST** |
| **Company** | **Comments** |
| Huawei | Slightly prefer option1 to have a completed resolution in HST |
|  |  |

**Issue 2-2: if the answer to issue 2-1 is Yes, how to perform the enhancement for inter-frequency measurement in idle mode for HST**

* Proposals
	+ Option 1 (QC, CATT, CMCC, Ericsson): using the same requirement as for intra-frequency measurement for HST

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR\_Inter [s] (number of DRX cycles) | Tmeasure,NR\_Inter [s] (number of DRX cycles) | Tevaluate,NR\_Inter[s] (number of DRX cycles) |
|  |
| 0.32 | 2.56 x M2 (8 x M2) | 0.32 x M3 (1 x M3) | 0.96 x M4 (3 x M4) |  |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |  |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |  |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |  |
| Note 1: when SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2 |  |

* + Option 2 (Xiaomi, MTK): The R16 enhanced EUTRA-NR inter-RAT measurement requirements in idle mode could be reused for NR inter-frequency measurements

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR\_Inter [s] (number of DRX cycles) | Tmeasure,NR\_Inter [s] (number of DRX cycles) | Tevaluate,NR\_Inter [s] (number of DRX cycles) |
|
| 0.32 | 4.16 x M2 (13 x M2)Note 1 | 0.64 x M3 (2 x M3)Note 1 | 0.96 x M4 (3 x M4) Note 1 |
| 0.64 | 7.68 (12)) | 1.28 (2) | 1.92 (3) |
| 1.28 | 12.8(10)  | 1.28 (1) | 3.84 (3) |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |
| Note 1: M2=1.5, M3=2 and M4=2 if SMTC periodicity of measured intra-frequency cell > 40 ms; otherwise M2=M2=M3=1. |

* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 2-2: if the answer to issue 2-1 is Yes, how to perform the enhancement for inter-frequency measurement in idle mode for HST** |
| **Company** | **Comments** |
| Huawei | Option 1 seems straight forward. |
|  |  |

### Sub-topic 2-2: inter-frequency measurement without MG, connected state

**Issue 2-3: PSS/SSS detection time requirement for inter-frequency measurement without MG in connected state for HST**

* Proposals
	+ Option 1 (vivo, CATT, CMCC, Xiaomi, MTK): For inter-frequency measurement outside measurement gaps, the enhancement for intra-frequency measurement in R16 HST can be reused, i.e. M2 is reused

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2x 5 x Kp) x max(SMTC period, DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

* Recommended WF
	+ 5 companies discussed this issue, and all the companies have the same view that M2 can be reused for PSS/SSS detection time requirement for inter-frequency measurement without MG.
	+ Moderator would like to check with companies whether following suggestion is agreeable:
		- For PSS/SSS detection for inter-frequency measurement without measurement gaps in connected state, the enhancement on PSS/SSS detection delay requirements specified for intra-frequency measurement in R16 HST can be reused, i.e. M2 is reused:

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max( 600ms, ceil(M2x 5 x Kp) x max(SMTC period, DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When [high speed] is not configured, M2 = 1.5. When [high speed] is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

|  |
| --- |
| **Issue 2-3: PSS/SSS detection time requirement for inter-frequency measurement without MG in connected state for HST** |
| **Company** | **Comments** |
| Huawei | Agree with the recommended WF |
|  |  |

**Issue 2-4: SSB index reading time requirement for inter-frequency measurement without MG in HST in connected state for HST**

* Proposals
	+ Option 1 (vivo, CATT, CMCC, Xiaomi, MTK): For inter-frequency measurement outside measurement gaps, the enhancement for intra-frequency measurement in R16 HST can be reused, i.e. M2 is reused

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_inter |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

* Recommended WF
	+ 5 companies discussed this issue, and all the companies have the same view that M2 can be reused for index detection delay requirement for inter-frequency measurement without MG.
	+ Moderator would like to check with companies whether following suggestion is agreeable:
		- * For index detection for inter-frequency measurement without measurement gaps in connected state, the enhancement on index detection delay requirements specified for intra-frequency measurement in R16 HST can be reused, i.e. M2 is reused:

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_inter |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(120ms, ceil (M2 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When [high speed] is not configured, M2 = 1.5. When [high speed] is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

|  |
| --- |
| **Issue 2-4: SSB index reading time requirement for inter-frequency measurement without MG in HST in connected state for HST** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Agree with the recommended WF |

**Issue 2-5: measurement delay requirement for inter-frequency measurement without MG in HST in connected state for HST**

* Proposals
	+ Option 1 (vivo, CMCC, CATT, Xiaomi, MTK): For inter-frequency measurement outside measurement gaps, the enhancement for intra-frequency measurement in R16 HST can be reused, i.e. M2 and Y are reused

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_inter  |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 160ms | max(200ms, ceil(M2 Note 2 x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| 160ms < DRX cycle≤ 320ms | ceil(4 x M2 Note 2 x Kp) x max(SMTC period,DRX cycle) |
| DRX cycle>320ms | ceil(Y Note 3 x Kp ) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 3: Y= 3 when SMTC <= 40ms, Y= 5 when SMTC > 40ms |

* Recommended WF
	+ 5 companies discussed this issue, and all the companies have the same view that M2 and Y can be reused for measurement delay requirement for inter-frequency measurement without MG.
	+ Moderator would like to check with companies whether following suggestion is agreeable:
		- * For measurement delay for inter-frequency measurement without measurement gaps in connected state, the enhancement on measurement delay requirements specified for intra-frequency measurement in R16 HST can be reused, i.e. M2 and Y are reused:

|  |  |
| --- | --- |
| DRX cycle | T SSB\_measurement\_period\_inter  |
| No DRX | max(200ms, ceil( 5 x Kp) x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 160ms | max(200ms, ceil(M2 Note 2 x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| 160ms < DRX cycle≤ 320ms | ceil(4 x M2 Note 2 x Kp) x max(SMTC period,DRX cycle) |
| DRX cycle>320ms | ceil(Y Note 3 x Kp ) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identifiedNOTE 2: When [high speed] is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 3: When [high speed] is configured, Y= 3 when SMTC <= 40ms, Y= 5 when SMTC > 40ms |

|  |
| --- |
| **Issue 2-5: measurement delay requirement for inter-frequency measurement without MG in HST in connected state for HST** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Agree with the recommended WF |

### Sub-topic 2-3: inter-frequency measurement with MG, connected state

**Issue 2-6: PSS/SSS detection time requirement for inter-frequency measurement with MG in connected state for HST**

* Proposals
	+ Option 1 (QC, Apple):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX |  Max(600ms, 6 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(6\*M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 6 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When high speed is not configured, M2 = 1.5; When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1 |

* + Option 2 (HW, CMCC): M2 defined in Rel-16 HST is reused for inter-frequency PSS/SSS detection delay requirements
	+ Option 3 (CATT, vivo, Xiaomi, MTK):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX |  Max(600ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(8\*M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

* + Option 4 (Nokia):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX |  Max(600ms, N Note 4 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(N Note 4\* M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | N Note 4 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When *highSpeedMeasFlag-r16* is not configured, M2 = 1.5; When *highSpeedMeasFlag-r16* is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1.NOTE 4: When *highSpeedMeasFlag-r16* is not configured, N = 8; otherwise N = 5. |

* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 2-6: PSS/SSS detection time requirement for inter-frequency measurement with MG in connected state for HST** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Option 2 is the same as option3. We support both. |

**Issue 2-7: SSB index reading time requirement for inter-frequency measurement with MG in HST in connected state for HST**

* Proposals
	+ Option 1 (QC, vivo, CATT, HW, CMCC, Xiaomi, Apple, MTK, Nokia): M2 is reused

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

* Recommended WF
	+ 9 companies discussed this issue, and all the companies have the same view that M2 can be reused for index detection delay requirement for inter-frequency measurement without MG.
	+ Moderator would like to check with companies whether following suggestion is agreeable:
		- * For index detection for inter-frequency measurement without measurement gaps in connected state, M2 is reused:

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When [high speed] is not configured, M2 = 1.5. When [high speed] is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

|  |
| --- |
| **Issue 2-7: SSB index reading time requirement for inter-frequency measurement with MG in HST in connected state for HST** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Support the recommended WF |

**Issue 2-8: measurement delay requirement for inter-frequency measurement with MG in HST in connected state for HST**

* Proposals
	+ Option 1 (QC):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 6 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle≤ 160ms | max(200ms, ceil(6 x M2 Note 3) x max(SMTC period,DRX cycle)) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | ceil(5 x M2 Note 3 x Kp) x max(SMTC period,DRX cycle) |
| DRX cycle>320ms | ceil( Y Note 4 x Kp ) x DRX cycle x CSSFintra |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 4: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms |

* + Option 2 (HW):

-7 samples for 160ms < DRX cycle≤ 320ms

-6 samples for DRX cycle>320ms and SMTC <= 40ms

* + Option 3 (CATT):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 160ms | Max(200ms, Ceil(8 × M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| 160ms < DRX cycle≤ 320ms | Max(200ms, Ceil(7 × M2) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 8 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When high speed is not configured, M2 = 1.5. When high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1. |

* + Option 4 (CMCC):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle≤ 160ms | Max(200ms, Ceil(8 × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| 160ms <DRX cycle ≤ 320ms | Max(200ms, Ceil([4] × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | Y Note 4 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 4: Y1= [3] when SMTC <= 40ms, Y1= [8] when SMTC > 40ms |

* + Option 5 (vivo, Xiaomi): For inter-frequency measurement with MG, the enhanced requirements specified for LTE-NR inter-RAT measurements in R16 HST could be used as baseline
	+ Option 6 (Apple):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, [6] × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil([6] × M2NOTE 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | [6] × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When [*highSpeedMeasFlag-r17*] is not configured, M2 = 1.5; When [*highSpeedMeasFlag-r17*] is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

* + Option 7 (MTK):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 8 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(200ms, Ceil(8 × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 4 × M2 Note 3× DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: When RRM enhancement for high speed is not configured, M2 = 1.5; When RRM enhancement for high speed is configured, M2 = 1.5 if SMTC periodicity > 40 ms;,otherwise M2=1. |

* + Option 8 (Nokia):

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 5 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle≤ 160ms | Max(200ms, Ceil(5 × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| 160 ms ≤DRX cycle ≤ 320ms | 4 × M2 Note 3× DRX cycle × CSSFinter |
| DRX cycle > 320ms |  Y Note 4 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms; otherwise M2=1NOTE 4: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms |

* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 2-8: measurement delay requirement for inter-frequency measurement with MG in HST in connected state for HST** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Support Option2Regarding legacy inter-frequency measurement period, 8 samples are applied where 3 additional samples are for AGC setting. As for intra-frequency measurement period in HST, sample numbers are reduced from 5 to 4 for 160ms < DRX cycle≤ 320ms, and reduced to 3 for DRX cycle>320ms and SMTC <= 40ms. It is suggested that 3 samples are still remained for AGC settling. Thus for inter-frequency measurement period with high speed-7samples for 160ms < DRX cycle≤ 320ms-6 samples for DRX cycle>320ms and SMTC <= 40ms |

### Sub-topic 2-4: the principle on the requirements if there are HST inter-frequency layers and non-HST inter-frequency layers to be measured

**Issue 2-9: the principle on the requirements if there are HST inter-frequency layers and non-HST inter-frequency layers to be measured**

* Proposals
	+ Option 1 (HW): If RAN4 decided to specify inter-frequency measurement enhancement in FR1 HST, the requirements shall follow the principle:

NHST\_inter-f carrier \* THST\_interf + NnonHST\_inter-f carrier \* TnonHST\_interf

* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 2-9: the principle on the requirements if there are HST inter-frequency layers and non-HST inter-frequency layers to be measured** |
| **Company** | **Comments** |
| XXX |  |
| Huawei | Support option 1. The above principle is applied in R16 HST inter-RAT cell reselection in idle mode. |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic #1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Topic #3: other

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109061**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109061.zip) | CATT | **Proposal 1: For SCell link recovery, it depends on network. There is no need to have the limitation in the spec.****Proposal 2: For CSSF, it depends on network. There is no need to have the limitation in the spec.****Proposal 3: Rel-17 NR HST RRM enhancement can be release independent from Rel-15.** |
| [**R4-2109514**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109514.zip) | CMCC | L1-SINR *Observation 1: the configuration of CMR/IMR is up to network configuration, there is no restriction on L1-SINR for HST scenario.**Observation 2: for SS-SINR, the reason to have upper bound of side condition is that there will be large frequency offset on the measurement of neighbour cell, which may result in ISI and have impact on the measurement of neighbour cell.**Observation 3: for L1-SINR, the measurement is performed on serving cell, there is no high frequency offset issue.****Proposal 1: legacy L1-SINR accuracy requirements can be reused for high speed train scenario, no restriction is needed.***Scell link recovery***Proposal 2: for scell link recovery, it is not preferred to have restriction on the number of band(s) supported for FR1 HST in the spec.***CSSF***Proposal 3: for CSSF, it is not preferred to have restriction on the number of Scell (s) supported for FR1 HST in the spec.***Network assistant signaling*Observation 4: according to TS38.331, legacy network assistant signaling highSpeedMeasFlag-r16 is transmitted in RRC IEs ServingCellConfigCommon, which means that highSpeedMeasFlag-r16 is signaled for SCell.**Observation 5: According to this IE description in TS38.331, highSpeedMeasFlag-r16 is used to indicate UE to apply enhanced RRM requirements to support high speed up to 500 km/h as specified in TS 38.133, which can be seen that this IE is more like a general indication of high speed train condition for RRM enhancement.****Proposal 4: it is proposed for RAN4 to further check whether highSpeedMeasFlag-r16 can be reused for the indication of application of enhanced RRM requirements for HST CA.***Release independent***Proposal 5: it is proposed that Rel-17 FR1 HST RRM enhancement is release independent from Rel-15.*** |
| [**R4-2109562**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109562.zip) | Qualcomm, Inc. | **Proposal 1: RAN4 to define the enhancement for inter-frequency measurement in idle mode.****Proposal 2: Set HST idle mode inter-frequency measurement requirement as Table 2-2.**

|  |  |  |  |
| --- | --- | --- | --- |
| DRX cycle length [s] | Tdetect,NR\_Inter [s] (number of DRX cycles) | Tmeasure,NR\_Inter [s] (number of DRX cycles) | Tevaluate,NR\_Inter[s] (number of DRX cycles) |
|  |
| 0.32 | 2.56 x M2 (8 x M2) | 0.32 x M3 (1 x M3) | 0.96 x M4 (3 x M4) |  |
| 0.64 | 5.12 (8) | 0.64 (1) | 1.92 (3) |  |
| 1.28 | 8.96 (7) | 1.28 (1) | 3.84 (3) |  |
| 2.56 | 58.88 (23) | 2.56 (1) | 7.68 (3) |  |
| Note 1: when SMTC < = 40 ms, M2 = M3 = M4 = 1; and when SMTC > 40 ms, M2 = 1.5, M3 = M4 = 2 |  |

Table 2‑2 Idle mode inter-frequency measurement requirement for HST**Proposal 3: Set HST connected mode inter-frequency measurement requirement as Table 2-3~5.**

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TPSS/SSS\_sync\_inter** |
| No DRX |  Max(600ms, 6 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(600ms, Ceil(6\*M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 6 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1 |

Table 2‑3 PSS/SSS detection time for inter-frequency measurement requirement in HST

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **T SSB\_measurement\_period\_inter** |
| No DRX | Max(200ms, 6 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle≤ 160ms | max(200ms, ceil(6 x M2 Note 3) x max(SMTC period,DRX cycle)) x CSSFintra |
| 160ms < DRX cycle≤ 320ms | ceil(5 x M2 Note 3 x Kp) x max(SMTC period,DRX cycle) |
| DRX cycle>320ms | ceil( Y Note 4 x Kp ) x DRX cycle x CSSFintra |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1NOTE 4: Y=3 when SMTC <= 40ms, Y=5 when SMTC > 40ms |

Table 2‑4 SSB measurement time for inter-frequency measurement requirement in HST

|  |  |
| --- | --- |
| **Condition NOTE1,2** | **TSSB\_time\_index\_inter** |
| No DRX | Max(120ms, 3 × Max(MGRP, SMTC period)) × CSSFinter |
| DRX cycle ≤ 320ms | Max(120ms, Ceil(3 × M2 Note 3) × Max(MGRP, SMTC period, DRX cycle)) × CSSFinter |
| DRX cycle > 320ms | 3 × DRX cycle × CSSFinter |
| NOTE 1: DRX or non DRX requirements apply according to the conditions described in clause 3.6.1NOTE 2: In EN-DC operation, the parameters, timers and scheduling requests referred to in clause 3.6.1 are for the secondary cell group. The DRX cycle is the DRX cycle of the secondary cell group.NOTE 3: M2 = 1.5 if SMTC periodicity > 40 ms, otherwise M2=1 |

Table 2‑5 SSB index reading time for inter-frequency measurement requirement in HST**Proposal 4: Follow Kp setting in R15 deactivated scell measurement requirement for HST enhancement.** |
| [**R4-2109633**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109633.zip) | MediaTek inc. | **Proposal 1: RAN4 need to confirm whether L1-SINR measurement is applied for HST or not. If not, then RAN4 may define no L1-SINR measurement requirement for HST clearly in TS 38.133.****Proposal 2: If RAN4 confirm the L1-SINR measurement will be applied for HST, then the upper bound of the side condition SSB Ês/Iot ≤5 dB should be introduced, for CMR only case at least.****Proposal 3: For SCell link recovery, RAN4 needs to study how many band(s) is supported in R17 HST in FR1.****Proposal 4: For CSSF, RAN4 needs to study how many SCell(s) is supported in R17 HST in FR1.** |
| [**R4-2110060**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110060.zip) | OPPO | ***Observation 1: Enhancements for RRC IDLE inter-frequency measurements rely on operators’ deployment demand.******Proposal 1: It is optional UE capability to be introduced for supporting HST inter-frequency measurement enhancement, including RRC Connected and Idle state.******Proposal 2: Clarify firstly whether L1-SINR measurement requirement is not applicable to HST or not.*** ***Observation 2: The number of bands should rely on both network configuration and UE capability of performing link recovery on CCs simultaneously.******Proposal 3: The link recovery requirements for R17 FR1 HST can follow the assumption of non-HST case, where the same limitation of non-HST scenarios should apply.******Proposal 4: CSSF should follow the assumption of non-HST case, without limitation on the number of Scells.******Proposal 5: Introduce new UE capability for supporting velocity up to 500km/h.******Observation 3: FFS release independent issues before conclusion of other issues related to new UE capabilities.*** |
| [**R4-2110212**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110212.zip) | Ericsson | ***Observation1: Enhancement on NSCC\_SSB for HST has two interpretations:**** ***Option1: Not both SCell(s) measured without MG and SCell(s) measured with MG are counted in NSCC\_SSB, which impacts the assumption of searcher limitation agreed before. it should be avoided to keep consistency between Non-HST and HST and revision consistency.***
* ***Option2: Limit NSCC\_SSB number. It is equal to limit CSSF value in second issue in fact and doesn’t change searcher limitation.***

***Proposal 1: Support option2, it isn’t suggested to explicitly limit CSSF value, i.e. number of Scell(s) supported in R17 HST FR1. It relies on network configuration.******Proposal 2: Issue of Kp for deactivated Scell*** ***also exists in non-HST scenario and R15, we prefer to stop discussion until clear conclusion and agreement in R15.*** ***Proposal 3: Support option 1. Rel-17 FR1 HST RRM enhancement can be release independent from Rel-15, similar with Rel-16 NR HST RRM enhancement.*** |
| [**R4-2110377**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110377.zip) | Huawei, HiSilicon | **Proposal 1: Kp shall also apply for measurement requirements on deactivated SCell in R17 FR1 HST, where Kp = 1/(1- (SMTC period /MGRP)).****Proposal 2: The HST enhanced inter-frequency measurement requirements can be defined as,*** **M2 defined in Rel-16 HST is reused for inter-frequency PSS/SSS detection delay requirements,**
* **M2 defined in Rel-16 HST is reused for inter-frequency time index detection delay requirements,**
* **Inter-frequency measurement period with high speed**

**-7 samples for 160ms < DRX cycle≤ 320ms****-6 samples for DRX cycle>320ms and SMTC <= 40ms****Proposal 3: If RAN4 decided to specify inter-frequency measurement enhancement in FR1 HST, the requirements shall follow the principle:****NHST\_inter-f carrier  \* THST\_interf + NnonHST\_inter-f carrier  \* TnonHST\_interf****Proposal 4: The same limitation on the number of band(s) on which UE is performing beam failure detection for SCell in R16 can be reused in R17 HST.** |
| [**R4-2111252**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111252.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: NSCC\_SSB enhancements should cover non-HST as well as HST. **Proposal 2: L1-SINR for CMR only does not seem to face the same side condition problem as SS-SINR; RAN4 can further validate.** **Proposal 3: Regarding CSSF, no need to have this limitation in the spec is preferred.**  |
| [**R4-2111261**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111261.zip) | vivo | **Proposal 1 No need to specify upper bound of the side condition as 5dB for L1-SINR.****Proposal 2 No need to have any limitation on the number of bands in the spec.****Proposal 3 No need to have any limitation on the number of bands in the spec.****Proposal 4 The release independent issue is not discussed until the features discussed in R17 FR1 HST becomes stable.** |
| [**R4-2111262**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111262.zip) | vivo | **Proposal 1 Further discuss the issue of CSSFoutside\_gap issue under TEI16.****Proposal 2 Rel-15/Rel-16 Kp requirements modification (if any) shall also apply for R17 HST.** |
| [**R4-2111263**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111263.zip) | vivo | **Proposal 1 For the scenarios of inter-frequency measurements, NR-DC scenarios can be considered.****Proposal 2 Inter-RAT NR carrier measurement requirements specified in TS 36.133 for R16 HST WI can be used at least as a baseline for inter-frequency measurement requirements within measurement gaps discussed in R17 FR1 HST WI.****Proposal 3 For inter-frequency measurement outside measurement gaps, similar enhancements that have been done to intra-frequency requirements in R16 HST can be re-used for R17 HST.****Proposal 4 CSSF enhancements for inter-frequency measurements can be considered for R17 HST.****Proposal 5 Idle/inactive inter-frequency requirements are also enhanced in R17 HST.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1: L1-SINR

**Issue 3-1: L1-SINR**

* Proposals
	+ Option 1 (CMCC): legacy L1-SINR accuracy requirements can be reused for high speed train scenario, no restriction is needed
	+ Option 1a (vivo): No need to specify upper bound of the side condition as 5dB for L1-SINR
	+ Option 2 (MTK, Ericsson): If RAN4 confirm the L1-SINR measurement will be applied for HST, then the upper bound of the side condition SSB Ês/Iot ≤5 dB should be introduced, for CMR only case at least
	+ Option 3 (MTK, OPPO ): Clarify firstly whether L1-SINR measurement requirement is not applicable to HST or not
* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 3-1: L1-SINR** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Option3 is suggested to be discussed firstly: whether L1-SINR reporting is needed in HST. The intention of L1-SINR reporting is for beam management. In typical FR1 HST network, the transmit beam is only 2. The necessity of configuration of L1-SINR report is not clear.If operators confirm to use L1-SINR in high speed scenario, we think there may be a cap on SINR upper bound. Although L1-SINR focus on serving cell which is different with SS-SINR, the Doppler shift is still larger than the non-HST scenario. We suggest to further evaluate this issue. |

### Sub-topic 3-2: SCell link recovery

**Issue 3-2: SCell link recovery**

* Proposals
	+ Option 1 (CATT, CMCC, vivo): For SCell link recovery, it depends on network. There is no need to have the limitation on the number of band(s)in the spec
	+ Option 2 (MTK): For SCell link recovery, RAN4 needs to study how many band(s) is supported in R17 HST in FR1
	+ Option 3 (OPPO, HW): The same limitation on the number of band(s) on which UE is performing beam failure detection for SCell in R16 can be reused in R17 HST
* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 3-2: SCell link recovery** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Support Option 3. In R16 eMIMO WI, BFD and CBD are extended to be performed on SCell. There is a restriction that UE is required to perform beam failure detection on no more than 1 serving cell per band. The scaling factor “PBFD” and “PCBD” are introduced for BFD and CBD requirements respectively. In ENDC or NEDC or SA, the “PBFD” and “PCBD” is Z for SCell where Z is the number of band(s) on which UE is performing beam failure detection only for SCell. In R17 HST, the same limitation on SCells can be reused for SCell link recovery. |

### Sub-topic 3-3: CSSF

**Issue 3-3: CSSF**

* Proposals
	+ Option 1(CATT, CMCC, Ericsson, Nokia, vivo): For CSSF, it depends on network. There is no need to have the limitation on the number of Scell (s) in the spec
	+ Option 2 (MTK): For CSSF, RAN4 needs to study how many SCell(s) is supported in R17 HST in FR1
	+ Option 3 (OPPO): CSSF should follow the assumption of non-HST case, without limitation on the number of Scells
* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 3-3: CSSF** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Option 1. Suggest to leave flexibility to network. |

3

### Sub-topic 3-4: signalling

**Issue 3-4: UE capability**

* Proposals
	+ Option 1 (OPPO, MTK): It is optional UE capability to be introduced for supporting HST inter-frequency measurement enhancement, including RRC Connected and Idle state
	+ Option 2 (CMCC): it is necessary to discuss whether a single UE capability can cover both CA enhancement and inter-frequency measurement enhancement
* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 3-4: UE capability** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | There is a parallel discussion in R16 HST capability where separate capability of intra-NR and inter-RAT NR are introduced additionally. To avoid such situation, decouple each capability is more attractive. So CA, inter-frequency measurement are suggested to be separate capability. |

**Issue 3-5: Network assistant signaling**

* Proposals
	+ Option 1 (CMCC): it is proposed for RAN4 to further check whether highSpeedMeasFlag-r16 can be reused for the indication of application of enhanced RRM requirements for HST CA
	+ Option 2 (Apple): NW shall indicate which inter-frequency layers need to be measured more often, for which enhanced inter-frequency measurement requirements shall apply
* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 3-5: Network assistant signaling** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Agree with option 1. As High speed network is dedicated network, the indication from network can be very simple. For example, when network has knowledge users are present in the network, an single indication for R17 RRM measurement enhancement can be indicated. Whether UE can support CA or inter-frequency measurement depends on UE reported capability.  |

### Sub-topic 3-5: release independent

**Issue 3-6: release independent**

* Proposals
	+ Option 1 (CATT, CMCC, Ericsson): Rel-17 NR HST RRM enhancement can be release independent from Rel-15
	+ Option 2 (vivo): The release independent issue is not discussed until the features discussed in R17 FR1 HST becomes stable
* Recommended WF
	+ More discussion is needed

|  |
| --- |
| **Issue 3-6: release independent** |
| **Company** | **Comments** |
| XXX | …. |
| Huawei | Demodulation is discussing the release independent issue in parallel. In our understanding, whether a feature is release independent is supposed to consider all aspects. We suggest to wait for the conclusion from other session. |

## Companies views’ collection for 1st round

### Open issues

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents