3GPP TSG-RAN WG4 Meeting #102-e R4- 2206919

E-meeting, February 21 – March 3, 2022

**Agenda item:** **10.16.8**

**Source: Qualcomm**

**Title: WF on NR extension to 71 GHz RRM requirements (Part 1)**

**Document for:** **Approval**

# Introduction

In this contribution we capture the agreements achieved during the email discussion on the topic Rel-17 NR ext. to 71GHz RRM core requirements (AI 10.16.8.1 and 10.16.8.2) in RAN4#102-e under email thread [102-e][224] NR\_ext\_to\_71GHz\_RRM\_1. This email thread covers following sub-agenda items:

* AI 10.16.8.1 General requirements
* AI 10.16.8.2 Timing requirements

The details on the discussion can be found at the [224] thread discussion summary [1].

The following color coding scheme is used in this document

* Agreements from GTW
* Agreements from the 1st round of email discussion
* Agreements from the 2nd round of email discussion

# Way forward

## General

**Rx beam sweeping scaling factor**

* Rx beam sweeping scaling factor is FFS
	+ Option 1: The Rx beam sweeping scaling factor is increased for FR2-2 compared with FR2-1
		- Companies to provide the values for the scaling factor.
	+ Option 2: Reuse the existing FR2-1 scaling factor for Rx beam sweeping for FR2-2.

## Timing requirements

### UE transmit timing error

**SSB periodicity and set of requirements**

* For UL SCS of 480/960 kHz, a UE is required to meet the UL timing accuracy requirements if an SSB is available in the last X ms
	+ X=80 ms for UL SCS of 480 kHz
	+ X=40 ms for UL SCS of 960 kHz
* Note: test cases will be defined for both cases
* Note: the agreement can be revisited in case no feasible Te requirements values are identified.

**Percentage of UL CP length Te can occupy for UL SCS of 480/960 kHz**

* For UL SCS of 480/960 kHz, a UE is required to meet the UL timing accuracy requirements if an SSB is available in the last X ms.
	+ For X = 80ms

|  |  |  |  |
| --- | --- | --- | --- |
| SSB SCS | UL SCS | Te/CP Ratio Option 1 | Option 2 |
| 120 | 480 | [0.35] | [0.38] |
| 480 | 480 | [0.30] | [0.35] |
| 960 | 480 | [0.25] | [0.30] |

* + For X = 40ms

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SSB SCS | UL SCS | Option 1 | Option 2 | Revised Option 2 | Option 3 |
| 480 | 960 | [0.40] | [0.43] | [0.43] | [0.31] |
| 960 | 960 | [0.40] | [0.38] | [0.40] | [0.31] |

**UE implementation margin to be considered in Te requirements**

* A UE implementation margin of **at-least** eDRIFT + eDAC + eRF\_Calibration is needed in addition to the DL timing estimation uncertainty of eRS

**SSB and UL SCS combinations**

* Define the requirements for SSB SCS of 120kHz and UL SCS of 480kHz.
* Do not define the requirements for SSB SCS 120kHz and UL SCS of 960kHz.

**Initial transmit timing accuracy test**

* FFS: Whether test cases for Te requirements for FR2-2 will be designed as having statistical nature or not.

### MRTD

**MRTD for intra-band non-contiguous CA**

* MRTD = [0.26] µs for non-contiguous intra band CA in FR2-2

**MRTD for FR1 and FR2-2 inter-band CA**

* FFS: The existing MRTD requirements for inter-band CA for FR1 and FR2-1 can be reused for inter-band CA for FR1 and FR2-2, i.e., MRTD = 25 µs

**MRTD for FR1 and FR2-2 NR DC - Synchronous**

* FFS: The existing MRTD requirements for FR1 and FR2-1 synchronous NR-DC can be reused for FR1 and FR2-2, i.e., MRTD = 33 µs

### MTTD

**Basic principles**

* Define MTTD requirements in FR2-2 based on the following rule:
	+ MTTD = MRTD + (TA step size / 2+ TA adjustment accuracy + Te) in cc1 + (TA step size / 2 + TA adjustment accuracy +Te) in cc2

**MTTD for FR1 and FR2-2 inter-band CA**

* FFS: The existing MTTD requirements for inter-band CA for FR1 and FR2-1 can be reused for inter-band CA for FR1 and FR2-2, i.e., MTTD = 26.1 us

**MTTD for FR1 and FR2-2 NR DC – Synchronous**

* FFS: The existing MTTD requirements for inter-band synchronous NR DC for FR1 and FR2-1 can be reused for inter-band synchronous NR DC for FR1 and FR2-2, i.e., MTTD = 34.1 us

### *deriveSSB-IndexFromCell*

**Assumptions on deriveSSB-IndexFromCell**

* Specify the frame boundary alignment tolerance for the case when deriveSSB-IndexFromCell is disabled for 960kHz SCS.
	+ Requirements are defined under assumption that UE may read PBCH payload.
* *deriveSSB-IndexFromCell* is not always enabled in unlicensed band in FR2-2.

**Frame boundary alignment tolerance**

* Define frame boundary alignment tolerance of SSB symbols as below:
	+ For 480kHz SCS – 3 SSB symbols
	+ For 960kHz SCS:
		- When deriveSSB-IndexFromCell is enabled – 3 SSB symbols
		- When deriveSSB-IndexFromCell is disabled – 6 SSB symbols
* Define frame boundary alignment tolerance of PDSCH when *deriveSSB-IndexFromCell* is enabled as below:

|  |  |  |
| --- | --- | --- |
| **SSB SCS (KHz)** | **Data SCS (KHz)** | **Frame boundary alignment tolerance of PDSCH symbols (deriveSSB-IndexFromCell enabled)** |
| 120 | 120 | / |
| 120 | 480 | 3 480KHz symbol |
| 120 | 960 | 6 960KHz symbol |
| 480 | 120 | 1 120KHz symbol |
| 480 | 480 | 3 480KHz symbol |
| 480 | 960 | 6 960KHz symbol |
| 960 | 120 | 1 120KHz symbol |
| 960 | 480 | 2 480KHz symbol |
| 960 | 960 | 3 960KHz symbol |

* Define frame boundary alignment tolerance of PDSCH when *deriveSSB-IndexFromCell* is disabled as below:

|  |  |  |
| --- | --- | --- |
| **SSB SCS (KHz)** | **Data SCS (KHz)** | **Frame boundary alignment tolerance of PDSCH symbols (deriveSSB-IndexFromCell disabled)** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| 960 | 120 | 1 120KHz symbol |
| 960 | 480 | 3 480KHz symbol |
| 960 | 960 | 6 960KHz symbol |

## Scheduling restrictions

**Scheduling restrictions when *deriveSSB-IndexFromCell* is enabled**

* FFS: Define the scheduling restrictions, when deriveSSB-IndexFromCell is enabled, based on Table below

|  |  |  |
| --- | --- | --- |
| **SSB SCS (kHz)** | **Data SCS (kHz)** | **Scheduling restriction including beam switching** |
| 120 | 120 | Existing requirements |
| 120 | 480 | (3+1) 480KHz symbols |
| 120 | 960 | (6+1) 960KHz symbols |
| 480 | 120 | 1 120KHz symbol |
| 480 | 480 | (3+1) 480KHz symbols |
| 480 | 960 | (6+1) 960KHz symbols |
| 960 | 120 | 1 120KHz symbol |
| 960 | 480 | (2+1) 480KHz symbols  |
| 960 | 960 | (3+1) 960KHz symbols |

**Scheduling restrictions when *deriveSSB-IndexFromCell* is disabled**

* When *deriveSSB-IndexFromCell* is not enabled for 960kHz SCS, no need to define scheduling restriction on all the symbols within the SMTC window
* FFS: Exact requirements

## Measurement procedures

**Cell detection**

* FFS: The impact of higher sampling rate and number of samples in PSS/SSS detection requirements.

**PBCH detection for SSB index acquisition**

* FFS: PBCH detection time for SSB index acquisition for 480/960 kHz SCS
* When *deriveSSB-IndexFromCell* is not enabled, use the following definition of TSSB\_time\_index\_intra for FR2-2:

|  |  |  |
| --- | --- | --- |
| DRX cycle | Without measurement gaps | With measurement gaps |
| No DRX | Max(200ms, ceil(MSSB\_index\_intra × Kp) × SMTC period) × CSSFintra | Max(200ms, ceil(MSSB\_index\_intra × Kp) × Max(MGRP, SMTC period)) × CSSFintra |
| DRX cycle≤ 320ms | Max(200ms, ceil(1.5 × MSSB\_index\_intra s × Kp) × Max(SMTC period, DRX cycle)) × CSSFintra | Max(200ms, ceil(1.5 × MSSB\_index\_intra × Kp) × Max(MGRP, SMTC period, DRX cycle)) × CSSFintra |
| DRX cycle>320ms | ceil(MSSB\_index\_intra × Kp) × DRX cycle × CSSFintra | ceil(MSSB\_index\_intra × Kp) × DRX cycle × CSSFintra |
| MSSB\_index\_intra will depend on the outcome of the PBCH index detection discussion and RF decision on supported power classes for FR2-2. |

* + FFS: MSSB\_index\_intra

# References

1. R4-2207065, Email discussion summary for [102-e][224] NR\_ext\_to\_71GHz\_RRM\_1, Qualcomm, RAN4 #102-e, February 21 – March 3, 2022