**3GPP TSG-RAN WG4 Meeting # 110-bis (draft)R4-2406391**

**Changsha, China, April 15 – 19, 2024**

**Title:** WF on defining the missing testing parameter for PC1/5/6

**Agenda Item:** 10.3

**Source:** Samsung

**Document for:** Approval

# Introduction

In RAN4 #109 meeting, RAN5 sent a LS on defining the missing relative angular offsets and UE gain-related parameters for different power classes to RAN4. In the LS, they indicate there are some testing parameters are missing, and PC6 would be better to define the parameters shown in the following Table, otherwise the WI cannot be completed in RAN5.



The Topic summary for [110bis][232] Reply\_LS including the missing parameters discussions please find in R4-2404843.

# Background

The following agreements were achieved in the last meeting ad-hoc, captured from [R4-2403446]

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| **Issue 2-1-1: RAN4 to clarify whether requested missing parameters need to be added from Rel-17 version of TS 38.133？*** Agreement:
	+ RAN4 shall introduce the requested missing parameters for different PCs from different releases:
		- PC1: from Rel-15
		- PC5: from Rel-17 (and release independent to early release)
		- PC6: from Rel-17

**Issue 2-1-3: do you agree to exclude 90 degrees relative offset between active probes in Table A.3.15.3-1 for PC6 UEs?*** Agreement:
	+ For PC6, the relative offset between active probes in Table A.3.15.3-1:
		- FFS to eliminate the option of 90 degrees

**Issue 2-1-5: For PC5, do you agree to define angular offset between active probes as for PC1, e.g., 30°, 60°, 90° and 120 degrees*** Agreement:
	+ For PC5, the relative offset between active probes in Table A.3.15.3-1:
		- 30°, 60°, 90° and 120 degrees

**Issue 2-1-6: How to consider Gain difference Y between fine and rough beams at Rx beam peak direction?*** Agreement:

|  |  |
| --- | --- |
|  | Value “Y” in dB, for each UE power class |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| [18] | 9.0 | 7.0 | FFS | [15.5] | [15.5] | FFS |

**Issue 2-1-7: How to consider Gain difference Z between fine and rough beams at Spherical coverage directions?*** Agreement:

|  |  |
| --- | --- |
|  | Value “Z” in dB, for each UE power class |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| [18] | 9.0 | 7.0 | FFS | [15.5] | [15.5] | FFS |

**Issue 2-1-8: How to consider SSB\_RP side condition?*** Agreement:
	+ For SSB\_RP side condition, add new column for PC6.
		- FFS the value during this meeting.

**Issue 2-1-10: whether the values of Minimum SSB\_RP in Table B.2.2-2: Conditions for intra-frequency measurements in FR2 also need to be defined for PC6 devices.*** Agreement:
	+ FFS the necessity of Minimum SSB\_RP in Table B.2.2-2:
		- If needed, companies prepare CR to complete Minimum SSB\_RP in Table B.2.2-2 in April/May meetings.

**Issue 2-1-11: UE gain G*** Agreement:
	+ FFS PC6 shall have the same UE gain as PC5
	+ FFS the value of UE gain for PC1, 5, and 6

**Issue 2-1-12: UE gain difference between inter-frequencies Ginter*** Agreement:
	+ For UE gain difference between inter-frequencies Ginter
		- [3dB] for PC1, PC5 and PC6

**Issue 2-1-13: the values of Rough Beam gain reduction “D”*** Agreement:
	+ RAN4 continue to discuss on the values of rough beam gain reduction “D”
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# Topic #1: LS on defining the missing relative angular offsets and UE gain-related parameters for different power classes (R5-237837)

## Sub-topic 1-1 The assumptions/values on defining the missing parameters

### Issue 1-1-1 What is the assumption for Gain difference Y and Z between fine beam and rough beam for PC1/5/6?

* Option 1:
	+ Gain difference Y between fine beam and rough beam for PC1/5/6 are as follows:

|  |  |
| --- | --- |
|  | Value “Y” in dB, for each UE power class |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18 | 9.0 | 7.0 | FFS | 15.5 | 15.5 | FFS |

* + Gain difference Z between fine beam and rough beam for PC1/5/6 are as follows:

|  |  |
| --- | --- |
|  | Value “Z” in dB, for each UE power class |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18 | 9.0 | 7.0 | FFS | 15.5 | 15.5 | FFS |

* + The assumption on the number of elements at UE
		- PC 1: 64; PC 5: 36; PC 6: 36

Other options are not precluded.

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### Issue 1-1-2 What is the UE gain G for PC 1/5/6?

 (Table B.2.1.5.1-1: UE gain G, Rx beam peak direction)

* Way Forward:
	+ The principle of defining the maximum value

|  |
| --- |
| From Wednesday RRM session on further discussion for the maximum value:* Assumption on the number of elements at UE:
	+ Option 1: largest number UE may have, for example,144 for PC1/5
	+ Option 2: [Typical] number for UE, for example, 64 for PC1/5/6
	+ Other options are not precluded
* How to derive the maximum UE gain:
	+ Option 1: Derive G based on the difference of the number of elements for PC1/5/6 w.r.t. that assumed for PC3
	+ Option 2: 20\*log(number of elements for PC1/5/6)
	+ Other options are not precluded
 |

* + The principle of defining the minimum value
		- Option 1: To define the minimum value based on the Sensitivity
		- Other options are not precluded
	+ The values of $G\_{min}$ and $G\_{max}$ for PC1/5/6
		- Option 1:

|  |  |
| --- | --- |
|  | UE Power class |
|  | 1 | 2 | 3 | 4 | 5 | 7 |
| Minimum, dBi | 0 | FFS | -10 | FFS | -5 | FFS |
| Maximum, dBi | 57 | FFS | +20 | FFS | 57 | FFS |

* + - Option 2:

|  |  |
| --- | --- |
|  | UE Power class |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| Minimum, dBi | -10 | FFS | -10 | FFS | -10 | -10 |
| Maximum, dBi | 29 | FFS | +20 | FFS | 26.5 | 26.5 |

* + - Option 3:

|  |  |
| --- | --- |
|  | UE Power class |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| Minimum, dBi | -18 | FFS | -10 | FFS | -23 | -23 |
| Maximum, dBi | 23 | FFS | +20 | FFS | 20 | 20 |

* + - Other options are not precluded

### Issue 1-1-3 What is the UE rough beam gain reduction D for PC 1/5/6?

(Table B.2.1.5.3-1: Rough Beam gain reduction “D” in Rx Beam Peak direction)

* Way Forward:
	+ Option 1:

|  |  |
| --- | --- |
|  | UE Power class |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| Maximum gain reduction, dB | 10.5 | FFS | 5.5 | FFS | 8.5 | 8.5 |

* + Option 2:
		- There is no need to define the value of rough beam gain reduction “D” in B.2.1.5 for PC6
	+ Other options are not precluded

### Issue 1-1-4 What is Ginter for PC 1/5/6?

 (Table B.2.1.5.2-1: UE gain difference between inter-frequencies Ginter)

* Option 1
	+ For UE gain difference between inter-frequencies Ginter
		- 3 dB for PC1 and PC6
		- FFS for PC5

Other options are not precluded.

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### Issue 1-1-5 Minimum CSI-RS\_RP for PC 6 UE?

* Option 1:
	+ There is no need to define the CSI-RS\_RP (Section B.2.4.2) for PC6, Rel-17/18 PC6 UE test cases in RAN4 are defined for SSB-based measurements only

Other options are not precluded.

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### Issue 1-1-6 Minimum SSB\_RP in Table B.2.2-2?

* Way Forward:
	+ Option 1:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Angle of arrival | NR operating bands | Minimum SSB\_RP Note 2, Note 3 | SSB Ês/Iot |
|  |  |  | dBm / SCSSSB | dB |
|  |  |  | SCSSSB = 120 kHz | SCSSSB = 240 kHz |  |
|  |  |  | UE Power class | UE Power class |  |
|  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 1, 2, 3, 4, 5, 6 |  |
| Conditions | Rx Beam Peak | n257 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 | -123.4+Y5 | -123.4+Y6 | (Value for SCSSSB = 120 kHz) +3dB | ≥-6 |
|  |  | n258 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 | -123.6+Y5 | -123.6+Y6 |  |  |
|  |  | n259 |  |  | -108.5 |  | -120.5+Y5 |  |  |  |
|  |  | n260 | -125.3+Y1 |  | -109.5 | -125.8+Y4 |  |  |  |  |
|  |  | n261 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 |  | -123.4+Y6 |  |  |
| n262 | -123.3+Y1 | -108,6 | -106.6 | -121.8+Y4 |  |  |
|  | Spherical coverage Note 1 | n257 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 | -115.4+Z5 | -115.4+Z6 | (Value for SCSSSB = 120 kHz) +3dB | ≥-6 |
|  |  | n258 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 | -115.6+Z5 | -115.6+Z6 |  |  |
|  |  | n259 |  |  | -95.7 |  |  |  |  |  |
|  |  | n260 | -117.3+Z1 |  | -96.9 | -113.8+Z4 |  |  |  |  |
|  |  | n261 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 |  | -115.4+Z6 |  |  |
| n262 | -115.1+Z1 | -96.7 | -93.5 | -109.7+Z4 |  |  |
| Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.Note 2: Values specified at the Reference point to give minimum SSB Ês/Iot, with no applied noise.Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ∆MBP,n and Spherical coverage values are increased by ∆MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. |

### Issue 1-1-7 Whether UE gain to PRS-RSRP measurement point for FR2 needs to be defined for PC 1, PC 5, and PC 6?

* Agreement:
	+ There is no need to define G gain in Clause 2.1.6 Gain to PRS-RSRP measurement point for FR2 for PC6
* Way Forward:
	+ RAN4 to discuss whether to/how to define the gain to PRS-RSRP measurement point for FR2 for PC1 and PC5.

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