**3GPP TSG-RAN WG4 Meeting #111 (draft) R4-2410294**

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

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

**Agenda Item:** 11.3

**Source:** Samsung

**Document for:** Approval

# Introduction

In RAN4 #109 meeting, RAN5 sent a LS [R5-237837] 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 Coffee break discussion minutes for Reply\_LS - Missing Test Parameters please find in R4-2410203.

# Topic #1: Missing relative angular offsets and UE gain-related parameters for different power classes

## 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?

* **Agreement**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Table B.2.1.3.1-1: Gain difference Y between fine and rough beams, Rx beam peak direction

|  |
| --- |
| 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 |

Table B.2.1.3.2-1: Gain difference Z between fine and rough beams, Spherical coverage directions

|  |
| --- |
| 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 |

 |

* + Appendix:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Proposal 1:* **For the gain difference Y and Z between fine beam and rough beam for PC1/5/6, the square brackets can be removed.**
* Table B.2.1.3.1-1: Gain difference Y between fine and rough beams, Rx beam peak direction

|  |
| --- |
| 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 |

* Table B.2.1.3.2-1: Gain difference Z between fine and rough beams, Spherical coverage directions

|  |
| --- |
| 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 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)

* **Agreement from ad-hoc minutes**

|  |
| --- |
| * For minimum dBi: value from proposal 1 agreed with [ ].
	+ Note: Value derived based on minimum EIS delta compared to PC3)
* For maximum dBi:
	+ Equation:
		- ~~Option 1:~~ 20log (# antenna element) +5dBi +3
			* FFS whether need to update the value for PC3 to align the equation
		- ~~Option 2: 10log (# antenna element) +5dBi +3 (PC3 assumption)~~
	+ Number of antenna elements
		- Option 1: 144 for PC1, 64 for PC5/6?
		- Option 2: aligned with the assumption from Y and Z
			* 64 for PC1, 36 for PC5/6
	+ Note: Test ability issue also need to be considered for feasible values of Gmin and Gmax
 |

* + Appendix:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| proposal 1: The Gmin and Gmax for PC 1/5/6 are defined as:

|  |  |
| --- | --- |
|  | 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 |

 |

* **Agreement from Wednesday RRM session**

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

|  |  |
| --- | --- |
|  | UE Power class |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Minimum, dBi | 0 | FFS | -10 | FFS | -5 | -5 | FFS |
| Maximum, dBi | +50 | FFS | +20 | FFS | +44 | +44 | FFS |

The above agreements on Gmax can be revisited if any testing issue will be identified in RAN5.  |

### 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)

* **Agreement**

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

|  |  |
| --- | --- |
|  | UE Power class |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| Maximum gain reduction, dB | 11.5 | FFS | 5.5 | FFS | 10 | 10 |

 |

### 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)

* **Agreement from Wednesday RRM session**

For UE gain difference between inter-frequencies Ginter, 3dB for PC1 and PC6, further discuss for PC5.

* **Agreement**

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

|  |  |
| --- | --- |
|  | UE Power class |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Maximum difference, dB | 3 | FFS | 3 | FFS | [3] | 3 | FFS |

 |

### Issue 1-1-5 Minimum SSB\_RP in Table B.2.2-2?

* **Agreement from Wednesday RRM session**

Table B.2.2-2: Conditions for intra-frequency measurements in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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]. |

* **Agreement**

(Computation with the updated Y1=18; Y5=Y6=15.5)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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 | -110.3 | -113.8 | -112.1 | -127.8+Y4 | -107.9 | -107.9 | (Value for SCSSSB = 120 kHz) +3dB | ≥-6 |
|  |  | n258 | -110.3 | -113.8 | -112.1 | -127.8+Y4 | -108.1 | -108.1 |  |  |
|  |  | n259 |  |  | -108.5 |  | -105 |  |  |  |
|  |  | n260 | -107.3 |  | -109.5 | -125.8+Y4 |  |  |  |  |
|  |  | n261 | -110.3 | -113.8 | -112.1 | -127.8+Y4 |  | -107.9 |  |  |
| n262 | -110.3 | -108.6 | -106.6 | -121.8+Y4 |  |  |
|  | Spherical coverage Note 1 | n257 | -102.3 | -102.8 | -101.2 | -118.8+Z4 | -99.9 | -99.9 | (Value for SCSSSB = 120 kHz) +3dB | ≥-6 |
|  |  | n258 | -102.3 | -102.8 | -101.2 | -118.8+Z4 | -100.1 | -100.1 |  |  |
|  |  | n259 |  |  | -95.7 |  |  |  |  |  |
|  |  | n260 | -99.3 |  | -96.9 | -113.8+Z4 |  |  |  |  |
|  |  | n261 | -102.3 | -102.8 | -101.2 | -118.8+Z4 |  | -99.9 |  |  |
| n262 | -97.1 | -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 1-1-6 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 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.
		- RAN4 may discuss whether/how to define G gain in TS 38.133, Clause B.2.1.6 “Gain to PRS-RSRP measurement point for FR2” for PC1/5.