3GPP TSG-RAN WG4 #100-e R4-2114993

Electronic Meeting, August 16-27, 2021

**Agenda item:** 9.16.6

**Source:** Qualcomm

**Title:** WF on co-existence simulation for NR\_ext\_to\_71GHz

**Document for:** Approval

# Introduction

This document presents the WF for co-existence simulation for extend to 71 GHz WI. The below items were agreed during the meeting.

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|  | Summary |
| Sub-topic 1-1 | **Synchronization assumption of indoor scenario:** Synchronized TDD is assumed as TR 38.803.  |
| Sub-topic 1-2 | **UE EIRP limit assumption:** Keep UE EIRP assumption in WF R4-2107915.  |
| Sub-topic 1-4 | **BS antenna model parameter:** Keep the current assumption in WF R4-2107915.  |

# Simulation assumptions

# 1.1 UMi scenarios

* **Proposals**
	+ Option 1: Cell size shrinking (i.e., ISD = 30 meters)
	+ Option 2: Consider only indoor deployments
	+ Option 3: Other ideas?
* Recommended WF:
	+ TBD

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| **Company** | **Comments** |
| CATT | My understanding option 2 may mean only consider the indoor scenario. We’re ok with both option 1 and option 2, with slightly preference of option 2. We didn’t have an analysis what ISD should be appropriate. Maybe some justification can be provided for 30 meters. |
| vivo | Generally, we can accept option 1 and option 2.For option 1, we share the same concern with 30 meters ISD as CATT’s comment.For Option 2, further clarification is needed.1. What is the minimum distance between the UE and BS? Keep the same 10m as in TR 38.901?
2. What should the indoor ratio be? 100% or 80%(in TR 38.901) or others?
 |
| Qualcomm | 30 meters were chosen as an example. No analysis was behind its selection. We wanted to derive a smaller number compared to what was agreed before (70 meters). QCOM also prefers option 2 as most companies has showed in their preliminary results that the link budget can be closed with the agreed list of parameters. We are option to other numbers than 30 meters. For option 2, we use a minimum distance of 0 meters between the UE and BSs, since BSs are ceiling mounted and the deployment region is basically 120x50 meters. Indoor ratio is set to 100% (i.e., all UEs are deployed indoor). We think that the above assumptions are ok, do other companies think we need to discuss minimum distance between UE and BS as well as indoor ratio? I added the UE-BS distance in the Table 1 in Section 1.3. |
| Nokia | We show in our simulation results that Indoor Office C is the most demanding scenario if all Dense Urban UE are outdoor. Thus we propose Option 3: Consider only Indoor Office C.Minimum 2D distance between indoor BS and UE is assumed to be zero, but there is still vertical distance between indoor BS and UE. |
| Qualcomm | Agree with Nokia on scenario C is a more stringent one. As discussed in previous meetings, we can look into scenarios A and C and decide the RF requirements based on the worst case scenarios.  |
| Nokia | We see no need to further simulate Indoor Office A as it is less stringent than Indoor Office C in all simulation results presented up to now. |

Majority of companies are ok with option 2. Thus, we can focus on indoor deployments for coexistence simulation work.

# 1.2 UE power control parameters

Moderator assumes the power control scheme in TR 38.803 will be reused, but some parameters may need to be modified.

For uplink scenario, TPC model specified in Section 9.1 TR 36.942 is applied



with following parameters.

* $CL\_{x-ile}=P\_{UE, conducted}-SNR\_{target}-Noise floor$
* $Noise floor= -174 +10log\_{10}\left(CBW\right)+Noise figure$
* γ = 1
* **Proposals**
	+ Option 1: UE minimum conducted power equals -20 dBm and SNR target equals 15 dB. For CLx-ile values, 66 for 100 MHz and 60 for 400 MHz are proposed.
	+ Option 2: TBD
* Recommended WF:
	+ TBD

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| **Company** | **Comments** |
| CATT | For CLx-ile caculation, may be some detail is needed. From what Nokia commented in the 1st round, CLx-ile = (Pcmax-(10\*log10(CBW)-174+BS NF+UE SNR target)), Pcmax=20(max EIRP)-10\*log10(1\*2\*2\*8)-5 (dBi)=0 dBm, then for CBW=100MHz, it seems CLx-ile=66, for CBW=400MHz, CLx-ile=60. And for the UE minimum conducted power, -20 dBm, Rmin can be derived to get -20-0=-20 dB. Is my understanding correct? |
| Vivo | We understand the derivation of the CLx-tile = 69 for target SNR = 15 dB and we can accept this, but we use the minimum conducted power = -40 dBm in TR 38.803 even for 70 GHz case, is there any justification for this change? |
| Qualcomm | We need to align if $P\_{UE, conducted}$ is the conducted power per polarization or the total conducted power for the two polarizations. For the former case, CL-xile values will be 3 dB lower. For the latter case, the above CL-xile values should be fine.  |
| Nokia  | The Pmax in the equation is the conducted power not the EIPR, otherwise you will see smaller than 15dB UL SINR at the BS. This is because the coupling loss (including all antenna and polarization gains) will be added to the UL Tx power after CLx\_ile is subtracted, the formula was derived to obtain 15dB UL SINR at the receiver antenna connector.The UL SINR at the receiver input (after all antenna, beamforming and polarization gains) should be 15dB, since polarization gain is included in coupling loss, it is not included in the conducted power, i.e. conducted power is per polarization. |
| Qualcomm | Pmax in the equation then is the conducted power per polarization which is 0 dBm. I’ve updated the CL-xile values in proposal 1 according to the discussion so far.  |

Based on the discussion below, it is agreed to consider 66 for 100 MHz and 60 for 400 MHz.

# 1.3 Coexistence simulation parameters summary

Companies agreed on the parameters provided in Table 1.

Table 1: Proposed list of coexistence simulation parameters

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| System Parameters | Deployment | Indoor office C in TR 38.808 (optional: Indoor office A in TR 38.808). Dense urban scenario A in TR 38.808 with ISD = 30 meters |
| Carrier Frequency | 60 GHz, 70 GHz |
| Channel BW | 100Mhz and 400MHz  |
| SCS | 120KHz for 100MHz and 960KHz for 400MHz |
| Number of active UEs | 1 |
|  | Channel model | InH open office model in TR 38.901. Umi model in TR 38.901 |
| LBT | No LBT considered (optional: consider LBT) |
| UE to BS 2D distance  | 0 meters for indoor deployment |
| BS | (Mg, Ng, M, N, P)  | (1,1,4,8,2) for indoor deployment(1,1,16,16,2) for dense urban deployment |
| (dv, dh) | (0.5 λ, 0.5 λ) |
| Antenna element gain  | 5 dBi |
| Antenna element radiation pattern | Indoor: Table A.2.1-7 in TR 38.802 for ceiling mount UMi: Table 7.3-1 in TR 38.901  |
| EIRP limit  | 40 dBm for indoor deployment52.8 dBm for dense urban deployment |
| Noise Figure  | 13 dB |
| UE | (Mg, Ng, M, N, P)  | (1,2,2,8,2) |
| (dv, dh) | (0.5 λ, 0.5 λ) |
| Antenna element gain | 5 dBi |
| Antenna element radiation pattern | Indoor and UMi: Table A.2.1-8 in TR 38.802 |
|  | EIRP limit  | 20 dBm  |
|  | Noise figure | 13 dB |
|  | LoS/ NLoS | LoS probability model defined in TR 38.803 |
|  | Maximum conducted power (per polarization) | 0 dBm |
|  | Minimum conducted power (per polarization) | -20 dBm |
|  | SNR target | 15 dB |
|  | CL-xile  | 66 for 100 MHz and 60 for 400 MHz.$ $ |

# Calibration and alignment

* + The followings are agreed for the steps of the calibration between companies:
1. Path loss
2. Coupling loss (path loss + BS antenna array gain + UE antenna array gain)
3. DL SINR at victim system
4. UL Tx power
5. UL SINR at victim system

Moderator’s note: Nokia commented on including the UL Tx power.

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| **Company** | **Comments** |
| CATT | Thanks for Nokia’s comments. We’re ok to include the UL Tx power. |
| vivo | We are also ok with the Nokia’s comment. |
| Qualcomm  | We are fine with Nokia’s comment.  |

Companies agreed on the above list (1) -(5) for calibration and alignment.

# Work plan for future meetings

The following meeting plan is agreed for the co-existence simulation.

* RAN4#100e: Agree the simulation assumption and the calibration aspects.
* During the period between RAN4#100e and RAN4#101e: Offline calibrate between the companies.
* RAN4#101e: Calibrate and align the simulation results, try to agree preliminary ACIR.
* RAN4#101b-e: Further update simulation results if any, agree the final ACIR requirement.

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| **Company** | **Comments** |
| CATT | If it’s agreed, CATT can volunteer to lead the calibration. |
| Qualcomm  | We are ok with the Work plan.  |

Agree on the above work plan.