**3GPP TSG RAN WG1 Meeting #122 R1-2506404**

**Bengaluru, India, Aug 25th – 29th, 2025**

**Source: Moderator (Interdigital, Inc.)**

**Title: Summary #1 of discussions for maintenance of Rel-19 7-24 GHz Channel Modeling SI**

**Agenda item: 8.8**

**Document for: Discussion**

# Introduction

In this contribution, moderator summarizes issues identified by the submitted contributions for RAN1 #122 agenda 8.8 regarding maintenance of channel model enhancement for 7 – 24 GHz SI.

# Suggested proposals for agreement/conclusion

To be filled.

# Summary of issues

## 3.1 Correction in UT antenna modeling text [1]

Huawei has notes that equation 7.3-3 notation for UT are slightly different and suggests writing correct notations.

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| 7.3.2 Polarized antenna modelling**Handheld UT Model:**< Unchanged parts are omitted >Each polarized field component of the reference radiation pattern and should be rotated according to the orientation and polarization direction of the each of UT antennae to get , using equation ~~(7.3-3),~~ , (7.3-x) (7.3-x) (7.3-x)where , and are obtained according to the orientation and polarization direction of each UT antenna, and then rotated based on the orientation of the UT in the global coordinate system to get and using Clause 7.1.3 equation (7.1-11).< Unchanged parts are omitted > |

Huawei’s proposal seems to be clarifying the description to avoid ambiguity. From the current description it is not clear if equation 7.3-3a and 7.3-3b should have been applied for double prime local coordinate system to prime local coordinate system for antenna elements or 7.1-16 and 7.1-17 should have been applied. Use of equation 7.3-3a and 7.3-3b only allows polarization to be shifted by slant angles, and cannot be rotated based on alpha, beta, and gamma. Therefore, moderator thinks Huawei’s suggestion is correct.

##### Proposal #1:

* Adopt the following TP to TR38.901
	+ ***Reason for change:*** Ambiguous application of antenna polarization for the handheld UT antenna.
	+ ***Summary of change:*** Clarify the polarization equation for handheld UT
	+ ***Consequences if not approved:*** Polarization application for handheld UT is ambiguous and can lead to companies with different implementation.

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| 7.3.2 Polarized antenna modelling**Handheld UT Model:**< Unchanged parts are omitted >Each polarized field component of the reference radiation pattern and should be rotated according to the orientation and polarization direction of the each of UT antennae to get , using equation ~~(7.3-3),~~ , (7.3-6) (7.3-7) (7.3-8)where , and are obtained according to the orientation and polarization direction of each UT antenna, and then rotated based on the orientation of the UT in the global coordinate system to get and using Clause 7.1.3 equation (7.1-11).< Unchanged parts are omitted > |

#### Round #1 Discussion

Please provide comments on Proposal #1, especially if companies have strong concerns about the proposal.

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| **Company** | **Comments** |
| Nokia | We support the clarification of the transformation. |
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## 3.2 Correction of angle description for near field propagation equation [3][11]

Two companies have noted that the angle description for near field propagation equation is missing. Therefore, suggest updates to clarify how the angles are derived. The following are two TP proposals.

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| 7.6.13 Near-field channel model<Unrelated parts are omitted>- To model the antenna element-wise antenna field patterns additionally, the is given by: (7.6-49)where and are the respective antenna element-wise elevation arrival angles and azimuth arrival angles for ray *m* of cluster *n* between the reference point at TRP side and receive antenna element *u*, and and are the respective antenna element-wise elevation departure angles and azimuth departure angles for ray *m* of cluster *n* between the transmit antenna element *s* and the reference point at UT side.<Unrelated parts are omitted> |

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| **TR 38.901 [1]****7.6.13 Near-field channel model**…- To model the antenna element-wise antenna field patterns additionally, the is given by: (7.6-49)where , are the ray-wise angular domain parameters of ray *m* cluster *n* between the transmit antenna element *s* and receive antenna element *u*.… |

Based on the two TPs, the first TP seem to be more inclusive change and therefore moderator suggests to take the first TP as basis for change.

##### Proposal #2:

* Adopt the following TP to TR38.901
	+ ***Reason for change:*** In the current TR 38.901 [1], antenna element-wise angular-domain parameters are introduced to additionally model the antenna element-wise field patterns for the NLOS channel impulse response in the near-field channel model. However, the definitions of these antenna element-wise angular-domain parameters are missing, leading to ambiguity in their interpretation.
	+ ***Summary of change:*** Add definitions for the antenna element-wise angular-domain parameters in equation 7.6-49 of TR 38.901 [1], which are introduced for modelling the antenna element-wise field patterns.
	+ ***Consequences if not approved:*** The expression for the angular-domain parameters in equation 7.6-49 of TR 38.901 [1] remains undefined, resulting in ambiguity and potential inconsistency in implementation.

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| 7.6.13 Near-field channel model<Unrelated parts are omitted>- To model the antenna element-wise antenna field patterns additionally, the is given by: (7.6-49)where and are the respective antenna element-wise elevation arrival angles and azimuth arrival angles for ray *m* of cluster *n* between the reference point at TRP side and receive antenna element *u*, and and are the respective antenna element-wise elevation departure angles and azimuth departure angles for ray *m* of cluster *n* between the transmit antenna element *s* and the reference point at UT side.<Unrelated parts are omitted> |

#### Round #1 Discussion

Please provide comments on Proposal #2, especially if companies have strong concerns about the proposal.

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| **Company** | **Comments** |
| Nokia | The version proposed by the moderator looks OK. |
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## 3.3 Typo Corrections [1][3][6][9]

Companies have provided corrections for several typos in the TR. The corrections should be straightforward and moderator assumes no critical issues from accepting the TPs.

##### Proposal #3:

* Adopt the following TP to TR38.901
	+ ***Reason for change***: (1) max subscript typo in Table 7.3-2 has been identified and it may lead to incorrect understanding of angle range; (2) incorrect copy of equation 7.3 to 7.3-3a has been identified and it may lead to incorrect implementation of antenna polarization model 1; (3) In TR38.901, for angle scaling of CDL models, the scaling factors of ZOA in Table 7.7.5.1-1 are the same as these of ZOD, which is not correct. In addition, there is an typo in Appendix A.5 for angle scaling.; (4) incorrect section referenced in Note of Table 7..7.5.1-1.; (5) Typo of “antenna” in Table 7.8-2A.
	+ ***Summary of change***: (1) removal of max subscript from horizontal cut of radiation power pattern in Table 7.3-2; (2) correction of sin theta prime to cos theta prime in equation 7.3-3a; (3) In TR38.901, for angle scaling of CDL models, the scaling factors of ZOA in Table 7.7.5.1-1 are changed to correct values. In Appendix A.5, P\_m is changed to P\_n.; (4) correcting section reference from Annex A.3 to A.5 in in Note of Table 7..7.5.1-1; (5) Correct typo for “antenna” in Table 7.8-2A.
	+ ***Consequences if not approved***: (1) ambiguous math notation for range of angles; (2) incorrect angle calculation for polarization model 1; (3) Incorrect scaling of ZOA for CDL models. (4) incorrect reference of the equations used to derivation of the scaling value for CDL model angle changes. (5) mis-spelled word in TR.

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| 7.3.0 Antenna array structure**< Unchanged text omitted >**Table 7.3-2: Radiation power pattern of a single antenna element for handheld UT

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| **Parameter** | **Values** |
| Vertical cut of the radiation power pattern (dB) |  |
| Horizontal cut of the radiation power pattern (dB) |  |
| 3D radiation power pattern (dB) |  |
| Maximum directional gain of an antenna element *GE,max* | 5.3 dBi |
| NOTE: For UT antenna modelling of handheld devices, optional antenna imbalance can be modelled. If modelled, randomized loss is applied per UT antenna port and randomized loss can be applied independently for the UL and DL directions. No imbalance is modelled by default. |

**< Unchanged text omitted >**7.3.2 Polarized antenna modelling**< Unchanged text omitted >****Model-1**:In case of polarized antenna elements assume is the polarization slant angle where degrees corresponds to a purely vertically polarized antenna element and degrees correspond to a pair of cross-polarized antenna elements. Then the antenna element field components in and direction are given by , (7.3-3)where  , (7.3-3a) . (7.3-3b)**< Unchanged text omitted >**7.7.5.1 CDL extension: Scaling of angles**< Unchanged text omitted >**Table 7.7.5.1-1: Scale factor values for each CDL model

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CDL Type** | **Desired AOD Spread（°）** | **Scale Factor (AOD)** | **Desired AOA Spread（°）** | **Scale Factor (AOA)** | **Desired ZOA Spread（°）** | **Scale Factor (ZOA)** | **Desired ZOD Spread（°）** | **Scale Factor (ZOD)** |
| CDL-A | 5 | 0.0680 | 30 | 0.3531 | 5 | 0.2397 ~~0.0352~~ | 1 | 0.0352 |
| 10 | 0.1360 | 45 | 0.5268 | 10 | 0.4802 ~~0.1056~~ | 3 | 0.1056 |
| 15 | 0.2041 | 60 | 0.6981 | 15 | 0.7225 ~~0.1761~~ | 5 | 0.1761 |
| 25 | 0.3405 |  |  |  |  |  |  |
| CDL-B | 5 | 0.1238 | 30 | 0.5417 | 5 | 0.6519 ~~0.1940~~ | 1 | 0.1940 |
| 10 | 0.2475 | 45 | 0.8081 | 10 | 1.3018 ~~0.5822~~ | 3 | 0.5822 |
| 15 | 0.3710 | 60 | 1.0709 | 15 | 1.9480 ~~0.9705~~ | 5 | 0.9705 |
| 25 | 0.6168 |  |  |  |  |  |  |
| CDL-C | 5 | 0.1281 | 30 | 0.4307 | 5 | 0.6476 ~~0.3643~~ | 1 | 0.3643 |
| 10 | 0.2568 | 45 | 0.6447 | 10 | 1.2971 ~~1.0929~~ | 3 | 1.0929 |
| 15 | 0.3864 | 60 | 0.8585 | 15 | 1.9504 ~~1.8219~~ | 5 | 1.8219 |
| 25 | 0.6513 |  |  |  |  |  |  |
| CDL-D | 5 | 0.3231 | 30 | 9.8888 | 5 | 4.3268 ~~0.4477~~ | 1 | 0.4477 |
| 10 | 0.6652 | 45 | N/A | 10 | 8.8868 ~~1.3469~~ | 3 | 1.3469 |
| 15 | 1.0594 | 60 | N/A | 15 | 14.0344 ~~2.2579~~ | 5 | 2.2579 |
| 25 | 5.8637 |  |  |  |  |  |  |
| CDL-E | 5 | 0.3950 | 30 | 2.9733 | 5 | 6.9195 ~~0.9714~~ | 1 | 0.9714 |
| 10 | 0.8009 | 45 | N/A | 10 | 14.8378 ~~2.9180~~ | 3 | 2.9180 |
| 15 | 1.2330 | 60 | N/A | 15 | 27.2849 ~~4.8774~~ | 5 | 4.8774 |
| 25 | 2.3627 |  |  |  |  |  |  |
| NOTE: Values of Table 7.7.5.1-1 were computed based on scaling factor calculation method described in Annex A.~~3~~5. |

**< Unchanged text omitted >**7.8.2 Full calibration **< Unchanged text omitted >**Table 7.8-2A: Simulation assumptions for full calibration

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| **Parameter** | **Values** |
| Scenarios  | UMa, UMi-Street Canyon, SMa |
| Carrier Frequency | 7 GHz,(optional) 15 GHz |
| BS antenna downtilting | Mechanical downtilt of 95 degrees for SMa for ISD = 1299mMechanical downtilt of 92 degrees for SMa for ISD = 1732mElectrical downtilt as in Table 7.8-1 for UMa and UMi-Street Canyon |
| BS antenna configurations | Config 3 for UMi, UMa, SMa at 7 GHz: Mg = Ng = 1, M = 8, N = 16, P = 2, dH = dV = 0.5λ … calibration metrics 1), 2), 3), 4) are calibrated(optional) Config 4 for UMa at 7 and 15 GHz: Mg = Ng = 1, M = 64, N = 16, P = 2, Mg = 1, Ng = 1, dH = dV = 0.5λ … calibration metrics 1), 2), 3), 4) are calibrated |
| BS Polarized antenna modelling | Model-2 in Clause 7.3.2 |
| BS port mapping | Config 3 for UMi, UMa, SMa at 7 GHz: Mp = 8, Np = 16, each antenna element is mapped to one port(optional) Config 4 for UMa at 7 and 15 GHz: Mp = 16, Np = 16Mp and Np are the number of vertical, horizontal TXRUs within a panel and polarization |
| BS Tx power | 49 dBm for SMa |
| Bandwidth | 20 MHz for 7 GHz(optional) 200 MHz for 7 and 15 GHz |
| UT attachment  | Based on RSRP (formula) from BS port 0 |
| UT distribution  | For SMa, 20% of UT outdoor, 80% of UT indoor. Among indoor UT, 90% of indoor UT are within residential buildings, and 10% of indoor UT in commercial buildings. Indoor UTs are uniformly distributed across all floors for a building type. |
| UT array orientation | Config B, C: Ω*UT,* uniformly distributed on [0,360] degree, Ω*UT,*= 45 degree, Ω*UT,* = 0 degreeConfig D: Ω*UT,* = 0 degree, Ω*UT,*= 0 degree, Ω*UT,* = 0 degree |
| UT antenna configurations | Config B for 7 GHz: 4 antenna port with single polarization for calibration based on handheld device antenna model using candidate antenna locations (1,7,3,5) as described in Clause 7.3(optional) Config C for 15 GHz: 16 antenna port with dual polarization based on handheld device antenna model using candidate antenna locations in (1,2,3,4,5,6,7,8) as described in Clause 7.3(only for metric 5) Config D: 8 antenna port with single polarization based on handheld device antenna model using candidate antenna locations in (1,2,3,4,5,6,7,8) as described in Clause 7.3 |
| UT antenna pattern | Config B, C, D: Based on directional antenna for handheld UT described in Clause 7.3 |
| UT Polarized antenna modelling | Config B, C, D: Based on directional antenna for handheld UT described in Clause 7.3 |
| O2I penetration loss | For SMa, low-loss A model |
| SCS assumption | 30 kHz |
| Additional metrics | 5) A~~n~~ntenna field pattern of handheld UT, and , in UT LCS using UT antenna configuration D  |

**< Unchanged text omitted >**A.5 Calculation of scaling factor for changing CDL model angular spreadThe following expression for the computing scaling factor, , to achieve a specific angular spread, AS, in degrees is given by (A-5) (A-6)where is the power for the *n*th cluster path, is the input cluster path angle (either AOA, AOD, ZOA, ZOD) given in degrees, is the power for the input LOS path, and is the input LOS path angle (either AOA, AOD, ZOA, ZOD) given in degrees. If input LOS path does not exist, is assumed.**< Unchanged text omitted >** |

#### Round #1 Discussion

Please provide comments on Proposal #3, especially if companies have strong concerns about the proposal.

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| **Company** | **Comments** |
| Nokia | OK with the corrections. |
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## 3.4 Correction of CDL angle scaling description [13]

Qualcomm suggest to splitting the angle scaling and subpath angle generation into two part for clarity.

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| 7.7.5 Extension for MIMO simulationsExtended MIMO link-level channel models can be constructed according to two alternative methods described in the following. 7.7.5.1 CDL extension: Scaling of anglesThe angle values of CDL models are fixed, which is not very suitable for MIMO simulations for several reasons; The PMI statistics can become biased, and a fixed precoder may perform better than open-loop and on par with closed-loop or reciprocity beamforming. Furthermore, a CDL only represents a single channel realization. The predefined angle values in the CDL models can be generalized by introducing angular translation and scaling. By translation, mean angle can be changed to and angular spread can be changed to match by scaling. The translated and scaled cluster (and ray () angles can be obtained according to the following equation: (7.7-5) (7.7-5a) (7.7-5b) (7.7-5c) (7.7-5)**< Unchanged text omitted >** |

##### Proposal #4:

* Adopt the following TP to TR38.901
	+ ***Reason for change***: Breaking up the cluster and ray scaling angles for CDL angle scaling, such that other WG may be able to reference the TR easily. Also improves readability of the angle scaling for CDL models.
	+ ***Summary of change***: introduce an intermediate variable to represent cluster angles, which are the angles being scaled by the model.
	+ ***Consequences if not approved***: Difficult for WGs to identify scaled angle component in CDL models.

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| 7.7.5.1 CDL extension: Scaling of anglesThe angle values of CDL models are fixed, which is not very suitable for MIMO simulations for several reasons; The PMI statistics can become biased, and a fixed precoder may perform better than open-loop and on par with closed-loop or reciprocity beamforming. Furthermore, a CDL only represents a single channel realization. The predefined angle values in the CDL models can be generalized by introducing angular translation and scaling. By translation, mean angle can be changed to and angular spread can be changed to match by scaling. The translated and scaled ray angles can be obtained according to the following equation: (7.7-5) (7.7-5a) (7.7-5b) (7.7-5c) (7.7-5d)in which:**< Unchanged text omitted >**- is the desired rms cluster angular spread,- is the scaled CDL cluster angle of the *n*th cluster,- is the resulting scaled ray angle that corresponds to *m*th subpath angle of *n*th cluster,**< Unchanged text omitted >**Alternatively, for CDL-D and CDL-E, if maintaining the LOS angle is desired, the translated and scaled ray angles can be obtained according to the following equation instead of using equation (7.7-5) and (7.7-5a): (7.7-6) (7.7-6a) (7.7-6b)in which:- is the LOS path angle of the model.- is the scaled CDL cluster angle of the nth cluster,**< Unchanged text omitted >** |

#### Round #1 Discussion

Please provide comments on Proposal #4.

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| **Company** | **Comments** |
| Nokia | The change does not look to be significant, and it does not change the procedure. However, we are OK because the clarity, indeed, might be improved.  |
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## 3.5 Addition of Isotropic Antenna for UT [3]

CATT is proposing to explicitly add isotropic antenna as part of the UT antenna model description. The changes are summarized in the following TP. Moderator thinks the suggestions for edit may not seem essential, but acceptable due to the fact isotropic is tested as part of channel model calibration. With that said, moderator thinks the TR should be still ok without the TP as well.

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| 7.3.0 Antenna array structure<Unrelated parts are omitted>**UT antenna model:**<Unrelated parts are omitted>- The antenna radiation power pattern of each antenna element for handheld UT is isotropic or the antenna radiation power pattern of each antenna element for handheld UT is generated according to Table 7.3-2.<Unrelated parts are omitted> |

##### Proposal #5:

* Adopt the following TP to TR38.901
	+ ***Reason for change***: Clause 7.3.0 of TR 38.901 [1] introduces the antenna array structures for UT considered for calibration in this SI. However, the isotropic UT antenna pattern used in calibration in clauses 7.8.1, 7.8.2, and 7.8.3 is not specified, leading to inconsistency between these clauses and clause 7.3.0.
	+ ***Summary of chang***: Add a description of the isotropic UT antenna pattern in clause, 7.3.0 to align with the calibration assumptions in clauses 7.8.1, 7.8.2 and 7.8.3.
	+ ***Consequences if not approved***: Calibration would be limited to directional UT antenna patterns, causing inconsistency across clauses and potentially impacting the reproducibility of simulation results.

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| 7.3.0 Antenna array structure<Unrelated parts are omitted>**UT antenna model:**<Unrelated parts are omitted>- The antenna radiation power pattern of each antenna element for handheld UT is isotropic or the antenna radiation power pattern of each antenna element for handheld UT is generated according to Table 7.3-2.<Unrelated parts are omitted> |

#### Round #1 Discussion

Please provide comments on Proposal #5.

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| **Company** | **Comments** |
| Nokia | We do not support this change.Firstly, isotropic radiation pattern for candidate UE antenna locations is used only in a single Additional feature calibration (near field), and 7.8.1, 7.8.2 are not using this model. For Near Field such a choice may be acceptable to avoid calibration of multiple features together, i.e., directional antennas and near filed.Secondly, the omni-directional radiation pattern is a theoretical abstraction, that cannot be achieved in practice for individual UE antennas. Antenna at target 6G frequencies have higher directivity even then a dipole. Therefore, we should not indicate omni-directional antennas as an acceptable model on the same level as the proposed directional model.  |
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## 3.6 Cluster removal threshold correction [5]

vivo is raising concerns on excessive removal of clusters for LOS cases. Currently the TR removes clusters below -25dB threshold after application of LOS scaling factor. Since LOS components are typically high powered, the likelihood of NLOS clusters to be removed by the -25dB threshold increases.

 

Figure 1: The ratio distribution of cluster number in UMi scenario, The ratio distribution of cluster number in indoor office scenario

From moderator understanding, the clarification to remove clusters after the LOS scaling was intentionally agreed in the last RAN1 meeting. Therefore, the moderator is unsure whether this proposal is an essential correction. With that said, it would be beneficial to get companies input on the proposal.

##### Proposal #6:

* Adopt the following TP to TR38.901
	+ ***Reason for change***: -25dB threshold to remove weak powered clusters may remove more than necessary number of clusters in case of LOS scenarios.
	+ ***Summary of chang***: Clarify the equation 7.5-6 is used for weak power cluster removal for all cases, NLOS and LOS.
	+ ***Consequences if not approved***: Removal of too many weak powered clusters in case of LOS scenarios.

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| **7.5 Fast fading model**Step 6: Generate cluster powers .Cluster powers are calculated assuming a single slope exponential power delay profile. Power assignment depends on the delay distribution defined in Table 7.5-6. With exponential delay distribution the cluster powers are determined by  (7.5-5)where  is the per cluster shadowing term in [dB]. Normalize the cluster powers so that the sum of all cluster powers is equal to one, i.e.,   (7.5-6)*In the case of LOS condition* an additional specular component is added to the first cluster. Power of the single LOS ray is:  (7.5-7)and the cluster powers are not normalized as in equation (7.5-6) , but:  (7.5-8)where δ(.) is Dirac's delta function and *KR* is the Ricean *K*-factor as generated in Step 4 converted to linear scale. These power values are used *only* in equations (7.5-9) and (7.5-14), but *not* in equation (7.5-22).**<Unchanged parts omitted>**Assign the power of each ray within a cluster as *Pn/ M*, where *M* is the number of rays per cluster.Remove clusters with less than -25 dB power compared to the maximum cluster power based on equation ~~(7.5-8), in case of LOS condition, and based on equation~~ (7.5-6)~~, otherwise,.~~ The scaling factors need not be changed after cluster elimination. |

#### Round #1 Discussion

Please provide comments on Proposal #6.

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| **Company** | **Comments** |
| Moderator | Updated proposal #6 to correct for incorrect reasons for change and cotents. |
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## 3.7 Other Proposals [12]

SKT has provided a number of proposals to improve the channel modeling and its applicability for 6G studies.

* Proposal 1. Provide an FR3 O2I/O2O loss maintenance table with (a) material penetration loss per canonical materials (standard/low-E glass, concrete, drywall, coated façade), (b) frequency trend exponents across 8/12/16/20/24 GHz grid points, and (c) O2I excess-loss dual-slope option for deep-indoor. Tables reuse 38.901 notations where possible.
* Proposal 2. Introduce an informative near-field/XL-MIMO annex: (i) a Fresnel boundary check (based on aperture size and carrier), (ii) optional cluster visibility maps along the array, and (iii) guidance for per-subarray parameter draws (birth/death rates) to emulate non-stationarity, with default OFF switch for Rel-19/Rel-20 evaluations.
* Proposal 3. Add representative FR3 indoor scenarios (Office-Open, Office-Dense, Retail-Atrium) with recommended delay/angle spread ranges and K-factor presets, anchored to recent FR3 measurement statistics and mapped onto 38.901 InH/Indoor-Factory nomenclature for compatibility. ResearchGatearXiv
* Proposal 4. Define FR3 blockage states (Clear/Partial/Deep) with (i) per-scenario occurrence probabilities, (ii) log-normal attenuation ranges, and (iii) sojourn/transition rates for pedestrian and vehicular dynamics, provided as a light-weight Markov option (default OFF) for reproducibility across companies.
* Proposal 5. Update UMa/UMi FR3 path-loss/foliage options by (i) adding foliage excess loss vs. seasonality (leaf-on) presets and (ii) clarifying cross-polarization ratio (XPR) ranges for street canyons vs. open squares; keep 38.901 reuse principle and offer these as scenario flags.
* Proposal 6. Publish an FR3 validation & reproducibility package: (i) fixed random seeds, (ii) band center set {8, 12, 16, 20, 24 GHz}, (iii) scenario catalog IDs (UMa/UMi/O2I/Indoor variants), and (iv) CSV schema (snapshot-ID, band, SNR, PL/σ, DS/AS, XPR, BLK-state, throughput). This mirrors prior ISAC reproducibility efforts while focusing on FR3 comm KPIs.

From moderator’s opinion, the proposals seem to be difficult to resolve as part of maintenance of the 7-24 GHz channel modeling enhancement SI. Moderator suggests to see if the issues can be discussed and resolved as part of the 6G SI.

#### Round #1 Discussion

Please provide comments on Proposals from SKT. Moderator’s recommendation to not move forward with the proposal as part of maintenance of the 7-24 GHz channel modeling enhancement SI.

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| **Company** | **Comments** |
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## 3.8 Inclusion of Updated Calibration Results

Companies have presented updated calibration results. Moderator suggests updating the calibration Tdoc in the TR.

##### Proposal #8:

* Adopt the following TP to TR38.901
	+ ***Reason for change***: Companies have provided updated channel model calibration results based on TR 38.901 v19.0.0. The updated calibration results is uncaptured in the TR.
	+ ***Summary of chang***: Update the calibration result Tdoc from R1-2504791 to R1-2506406 in Section 7.8.
	+ ***Consequences if not approved***: outdated calibration results are present in the TR.

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| 7.8 Channel model calibration7.8.1 Large scale calibration  **<Unchanged parts omitted>**Additional calibration parameters can be found in Table 7.8-1A. It is assumed that parameters from Table 7.8-1 is used if unspecified by the additional calibration parameters in Table 7.8-1A. In addition, calibration of UMa and UMi-Street Canyon at 6 GHz carrier frequency using simulation assumptions in Table 7.8-1 with updated channel modeling is part of the additional calibration. The calibration results based on additional calibration parameters can be found in ~~R1-250 2504791~~R1-2506406.**<Unchanged parts omitted>**7.8.2 Full calibration **<Unchanged parts omitted>**The calibration results based on additional calibration parameters can be found in ~~R1-2504791~~ R1-2506406.**<Unchanged parts omitted>**7.8.3 Calibration of additional features **<Unchanged parts omitted>**The additional calibration results can be found in ~~R1-2504791~~ R1-2506406.**<Unchanged parts omitted>** |

## 3.9 Additional Clarifications

It has come to the attention of the moderator that handheld UT antenna radiation pattern orientation clarification could be useful for companies to correctly generate the final UT antenna pattern for handheld UTs. The suggested clarification would be to clarify that antenna radiation pattern defined in 7.3-2 is directed in x’’-axis, which is and direction. The actual antenna radiation pattern should be rotated based on the directional vector already described in the TR.

##### Proposal #9:

* Adopt the following TP to TR38.901
	+ ***Reason for change***: Ambiguous orientation antenna radiation power pattern for pattern defined in Table 7.3-2.
	+ ***Summary of chang***: Clarify that antenna radiation power pattern in Table 7.3-2 is oriented in and direction and final antenna field pattern for each antenna element should be rotated according to descriptions in the TR.
	+ ***Consequences if not approved***: Ambiguous antenna radiation power pattern orientation could lead to incorrect implementation of the final handheld UT antenna field patterns among companies.

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| 7.3.0 Antenna array structure*<unchanged text omitted>***UT antenna model:***<unchanged text omitted>*- The antenna radiation power pattern of each antenna element for handheld UT is generated according to Table 7.3-2 which assumes antenna is assumed to be oriented in and direction. Antenna radiation power pattern is rotated based on directional vector described above. Table 7.3-2: Radiation power pattern of a single antenna element for handheld UT

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| --- | --- |
| **Parameter** | **Values** |
| Vertical cut of the radiation power pattern (dB) |  |
| Horizontal cut of the radiation power pattern (dB) |  |
| 3D radiation power pattern (dB) |  |
| Maximum directional gain of an antenna element *GE,max* | 5.3 dBi |
| NOTE: For UT antenna modelling of handheld devices, optional antenna imbalance can be modelled. If modelled, randomized loss is applied per UT antenna port and randomized loss can be applied independently for the UL and DL directions. No imbalance is modelled by default. |

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#### Round #1 Discussion

Please provide comments on Proposal #9.

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| **Company** | **Comments** |
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## 3.10 Handheld UT Antenna Model Update

While there was no specific Tdoc submitted for handheld UT antenna model issue. Issue came up in offline discussions regarding the current handheld UT antenna radiation power pattern.

The current radiation power pattern has different power values for different when or . In reality, this is not possible as different azimuth values are actually the same point in space when point is zenith or nadir.

Table 7.3-2: Radiation power pattern of a single antenna element for handheld UT

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| --- | --- |
| **Parameter** | **Values** |
| Vertical cut of the radiation power pattern (dB) |  |
| Horizontal cut of the radiation power pattern (dB) |  |
| 3D radiation power pattern (dB) |  |
| Maximum directional gain of an antenna element *GE,max* | 5.3 dBi |
| NOTE: For UT antenna modelling of handheld devices, optional antenna imbalance can be modelled. If modelled, randomized loss is applied per UT antenna port and randomized loss can be applied independently for the UL and DL directions. No imbalance is modelled by default. |

Sinc the radiation power pattern is assumed to symmetric from the center of maximum direction gain axis, a perfectly asymmetric radiation power pattern can be generated by the following.

|  |  |
| --- | --- |
| **Parameter** | **Values** |
| Vertical cut of the radiation power pattern (dB) | Radiation power pattern should be same as the Horizontal cut with maximum power at  |
| Horizontal cut of the radiation power pattern (dB) |  |
| 3D radiation power pattern (dB) |  |
| Maximum directional gain of an antenna element *GE,max* | 5.3 dBi |
| NOTE: For UT antenna modelling of handheld devices, optional antenna imbalance can be modelled. If modelled, randomized loss is applied per UT antenna port and randomized loss can be applied independently for the UL and DL directions. No imbalance is modelled by default. |

The resulting UT radiation power pattern is nearly identical for most azimuth and zenith angles, but does not have inconsistent radiation power pattern around zenith and nadir.





As seen in power pattern figure above, the current UT radiation power power pattern shows a range of power values for different azimuth angles when zenith angle is 0 or 180. The corrected smooth UT radiation power pattern has identical power values for all azimuth angles when zenith angle is 0 or 180. This removes the odd shape near zenith and nadir of the spherical shape of the radiation power pattern.

**Please note that given that the issue was not brought up from Tdoc submissions and it is a late change for the TR. Careful consideration should be taken before approval of the proposal.**

##### Proposal #10:

* Adopt the following TP to TR38.901
	+ ***Reason for change***: handheld UT antenna radiation power pattern exhibits unrealistic power deviation when and when is any value. The radiation power should be identical irrespective of azimuth angle , but exihibits different power values based on azimuth angle
	+ ***Summary of chang***: Update the UT antenna radiation power pattern such that is completely symmetric with respect to direction center axis. Use the horizontal cut of the radiation power pattern to also apply to vertical cut of the radiation power pattern. For radiation power values at non-horizontal plane, calculate the radial distance from x’’-axis (in Y-Z plain) and use that as y’’-axis value for obtain the effective power value in horizontal plane (X-Y plane).
	+ ***Consequences if not approved***: Unrealistic radiation power pattern definition near the zenith and nadir for handheld UT antenna.

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| 7.3.0 Antenna array structure*<unchanged text omitted>***UT antenna model:***<unchanged text omitted>*- The antenna radiation power pattern of each antenna element for handheld UT is generated according to Table 7.3-2. Table 7.3-2: Radiation power pattern of a single antenna element for handheld UT

|  |  |
| --- | --- |
| **Parameter** | **Values** |
| Vertical cut of the radiation power pattern (dB) | Radiation power pattern should be same as the Horizontal cut with maximum power at  |
| Horizontal cut of the radiation power pattern (dB) |  |
| 3D radiation power pattern (dB) |  |
| Maximum directional gain of an antenna element *GE,max* | 5.3 dBi |
| NOTE: For UT antenna modelling of handheld devices, optional antenna imbalance can be modelled. If modelled, randomized loss is applied per UT antenna port and randomized loss can be applied independently for the UL and DL directions. No imbalance is modelled by default. |

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#### Round #1 Discussion

Please provide comments on Proposal #10.

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| **Company** | **Comments** |
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# Summary of Agreements/Conclusions from RAN1 #122

To be filled.

# Reference

1. R1-2505224, “Maintenance issues on 7-24 GHz channel modeling”, Huawei, HiSilicon
2. R1-2505225, “Calibration results for 7-24GHz channel modeling”, Huawei, HiSilicon
3. R1-2505238, “Maintenance of FR3 Channel Modellin”, InterDigital, Inc.
4. R1-2505294, “Maintenance on channel modelling enhancements for 7-24GHz”, CATT
5. R1-2505385, “Maintenance on 7-24GHz channel modeling”, vivo
6. R1-2505499, “Remaining issues on 7-24 GHz channel model”, ZTE Corporation, Sanechips
7. R1-2505549, “Remaining issues on channel modelling enhancements for 7-24 GHz for NR”, Samsung
8. R1-2505653, “Maintenance on channel model enhancements for 7-24 GHz for NR”, Sharp
9. R1-2505730, “Text proposals and calibration results for 7-24GHz channel modeling”, OPPO
10. R1-2505766, “Calibration results for 7-24 GHz channel model”, Intel
11. R1-2505884, “Maintenance and Calibration of Channel Model for 7-24 GHz”, Apple
12. R1-2505978, “Discussion on R19 FR3 Channel Model Maintenance”, SK Telecom
13. R1-2506187, “Maintenance on channel modelling enhancements for 7-24GHz for NR”, Qualcomm Incorporated
14. R1-2506374, “Calibration results for 7-24 GHz channel model”, Ericsson
15. R1-2506382, “Updated Calibration Simulation Results for Channel Modelling Enhancements for 7-24GHz for NR”, Nokia Germany