**3GPP TSG RAN Meeting #104 RP-241610**

**Shanghai, China, 17th – 20th June, 2024** (Revision of RP-241592)

**Source: Nokia, BT Plc, AT&T, Bell Mobility, Bouygues Telecom, China Telecom, CMCC, Deutsche Telekom, Ericsson, Intel Corporation, KDDI, Keysight, KT Corp., MediaTek, NTT Docomo, Orange, Qualcomm, Rohde & Schwarz, Samsung, SK Telecom, Spark NZ, Telecom Italia, Telefonica, Telenor, Telia Company, Telstra, T-Mobile USA, Verizon, Vodafone, ZTE Corporation**

**Title:** **New SID: Study on spatial channel model for demodulation performance requirements**

**Document for: Approval**

**Agenda Item: 9.1.4**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

# Title: Study on spatial channel model for demodulation performance requirements

## Acronym: FS\_NR\_demod\_SCM

## Unique identifier:

NOTE: For new WIs/SIs leave the Unique identifier empty and make a proposal for an Acronym.

 For a revised WI/SI: Take Unique identifier and acronym as shown in 3GPP workplan.

 If this is a RAN WID including Core and Perf. part, then Title, Acronym and Unique identifier refer to the feature WI.

 Please tick (X) the applicable box(es) in the table below:

 Either:

|  |  |
| --- | --- |
| **This WID includes a Core part** |  |
| **This WID includes a Performance part** |  |

 or:

|  |  |
| --- | --- |
| **This WID includes a Testing part** |  |
| **and it addresses the following 3GPP work area:** | **Radio Access** |  |
| **Core Network** |  |
| **Services** |  |

Potential target Release: Rel-19.

Note that this field above indicates the proposed Release at the time of submission of the WID to TSG approval. It can later be changed without a need to revise the WID. The updated target Release is indicated in the Work Plan. NOTE: In case of contradiction with the target dates of clause 5, clause 5 determines the target release.

## 1 Impacts *{For Normative work, identify the anticipated impacts. For a Study, identify the scope of the study.}*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Affects:** | UICC apps | ME | AN | CN | Others (specify) |
| **Yes** |  | X | X |  |  |
| **No** | X |  |  | X | X |
| **Don't know** |  |  |  |  |  |

## 2 Classification of the Work Item and linked work items

### 2.1 Primary classification

This work item is a …

|  |  |
| --- | --- |
|  | Feature |
|  | Building Block |
|  | *Work Task* |
| X | Study Item |

### 2.2 Parent Work Item

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| N/A |  |  | N/A |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work Items (if any) |
| Unique ID | Title | Nature of relationship |
|  |  |  |
| 801001 | Study on radiated metrics and test methodology for the verification of multi-antenna reception performance of NR UEs | *REL-16 SI FS\_NR\_MIMO\_OTA\_test which produced TR 38.827* |
|  |  |  |
|  |  |  |

**Dependency on non-3GPP (draft) specification**:

None.

## 3 Justification

Limitations of the existing method for channel modelling for RAN4 performance requirements using the spatially agnostic Tapped Delay Line (TDL) or spatially deficient TDL + antenna correlation approaches have been discussed in RAN1 and in RAN4. These limitations may be attributed to the fact that TDL channels on their own are spatially agnostic, i.e., any direction to transmit signals through the channel is as good as any other, which impacts performance of different MIMO layers matched to differing large scale environments. Such shortcomings are, for example, visible in 2-codeword requirements in Rel-18, where both codewords have the same performance requirements at the same time.

Furthermore, spatially separating multiple users via MIMO receivers or MU precoding codebooks is only possible if the UEs’ channels are spatially separable using 5G NR specified reference signals. As a result, neither the Rel-16 NR\_eMIMO WI, nor the Rel-17 NR\_feMIMO WI were able to find a TDL based test setup suitable for the MU use case for which the newly introduced codebooks are designed.

Even if the UE conforms to the current minimum performance requirements, this does not guarantee that in the field the UE will make a reasonably efficient use of MIMO features specified since R15, e.g., providing appropriate channel state information to the network such that the network can make optimal use of the available MIMO layers.

MNOs have invested heavily in roll-out of 5G NR MIMO systems with enhancements specified since R15. MIMO feature performance requirements need to be set under adequate test conditions that mimic MIMO effects observed in deployment as much as possible. The currently used TDL channels do not exhibit these effects nor match the expected statistics of a measured channel.

Specified minimum performance requirements for the standardised features play an important role in deployment and planning of mobile networks that deliver services using 3GPP-specified functionality.

As such it is very important to add a consistent spatial component to the channel model for RAN4 requirements, and RAN4 should identify the most appropriate way to address such spatial differentiation in Rel-19.

The same arguments apply for both uplink and downlink, including massive MIMO deployments.

## 4 Objective

### 4.1 Objective of SI or Core part WI or Testing part WI

### 4.2 Objective of Performance part WI

NOTE: Leave empty if the WI proposal does not contain a RAN performance part.

None.

### 4.3 RAN time budget request (not applicable to RAN5 WIs/SIs)

NOTE: For all new RAN related WIs/SIs which are not led by RAN WG5 the WI/SI rapporteur has to fill out the attached Excel table to request time budgets for corresponding RAN WG meetings.
The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI.
One time unit (TU) corresponds to ~ 2 hours in the meeting.
If no TU is needed, then leave the field empty otherwise enter a number >0 in the field.

 For revisions of already approved WI/SI descriptions: Please remove the Excel table from the WID/SID's zip file. The time budgets are already recorded. If you want to modify them, then this has to be done via the status report and not via a revised WID/SID.

 If this WID is covering Core and Performance part, then please fill out one line for each part in the attached Excel table.

**additional comments to the time budget request in the attached Excel table:**

## 5 Expected Output and Time scale

|  |
| --- |
| **New specifications** *{One line per specification. Create/delete lines as needed}* |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Remarks |
| Internal TR | 38.xxx | Study on spatial channel model for demodulation performance requirements | RAN#107 | RAN#108 | Led by RAN4,rapporteur: Alex Hamilton; alexander.hamilton@nokia.com  |

*{Note 1: Only TSs may contain normative provisions. Study Items shall create or impact only TRs.
"Internal TR" is intended for 3GPP internal use only whereas "External TR" may be transposed by OPs.}*

NOTE: If this is a RAN WI including Core and Perf. part, then all new Core part specs have to be listed first and then all new Perf. part specs. Indicate "Core part" or "Perf. part" under Remarks for each spec.
By default a new specs can only be new for one of both parts.

|  |
| --- |
| **Impacted existing TS/TR** *{One line per specification. Create/delete lines as needed}* |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |
|  |  |  |  |
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NOTE: If this is a RAN WI including Core and Perf. part, then all new Core part specs have to be listed first and then all new Perf. part specs. Indicate "Core part" or "Perf. part" under Remarks for each spec.
If an existing spec is affected by both (Core part and Perf. part), then it has to be listed twice with appropriate approval dates.

## Work item Rapporteur(s)

Hamilton, Alex; Nokia; alexander.hamilton@nokia.com

## 7 Work item leadership

Primary responsibility: RAN WG4

## 8 Aspects that involve other WGs

NOTE: For RAN WIs: Section 8 applies only to WGs outside of TSG RAN because RAN WG aspects have to be covered in section 4.

## 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| AT&T |
| Bell Mobility |
| Bouygues Telecom |
| BT Plc. |
| China Telecom |
| CMCC |
| Deutsche Telekom |
| Ericsson |
| Intel Corporation |
| KDDI |
| Keysight |
| KT Corp. |
| MediaTek |
| Nokia |
| NTT Docomo |
| Orange |
| Qualcomm |
| Rohde & Schwarz |
| Samsung |
| SK Telecom |
| Spark NZ |
| Telecom Italia |
| Telefonica |
| Telenor |
| Telia Company |
| Telstra |
| T-Mobile USA |
| Verizon |
| Vodafone |
| ZTE Corporation |