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| **Radiocommunication Study Groups** |  |
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| Source: The Fifth Generation Mobile Communications Promotion Forum | **Document 5D/753-E** |
| **20 September 2021** |
| **English only**  **TECHNOLOGY ASPECTS** |
| Director, Radiocommunication Bureau[[1]](#footnote-1)\* | |
| FINAL Revised evaluation results (Reliability) from The Fifth Generation Mobile Communications Promotion Forum on the IMT-2020 proposal in Document IMT-2020/18(rev.1) by “Nufront” IN THE EXTENDED IMT-2020 EVALUATION PROCESS | |
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This document describes the final updated evaluation result of Reliability by 5GMF Evaluation Group regarding the IMT-2020 candidate technology submission in Document [IMT-2020/18(Rev.1)](https://www.itu.int/md/R15-IMT.2020-C-0018/en) by “Nufront”. The candidate technology was evaluated as the reset to Step 4 in the extended IMT-2020 evaluation process. The WG Technology Aspects (Option 2) meeting in August 2021 invited Nufront and 5GMF to continue the dialog on the outstanding issues, according to the agreed actions for closure of the process for Working Party (WP) 5D meeting #39. The agreed actions for the technical performance requirements above are described in [Annex 12 to Document 5D/746](https://www.itu.int/dms_ties/itu-r/md/19/wp5d/c/R19-WP5D-C-0746!N12!MSW-E.docx).

1. **RS pollution**

After the WG Technology Aspects (Option 2) meeting in August 2021, 5GMF had correspondence with Nufront on Reliability and potential RS pollution, and the following document was provided by Nufront.

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1. **Revised evaluation results of Reliability (source 4, 4GHz)**

In the ITU-R WP 5D WG Technology Aspects (Option 2) meeting, the proponent stated the phase shift function could be used in low-error mode. However, 5GMF is of the view that the phase shift is not applied to long preamble (CRS) in the low error mode according to the EUHT specification (Attachment 5.4 to 5D/222), For detail, please refer to document “5GMF\_reply\_to\_Nufront (20210825)\_RS Pollution.pdf” below.



5GMF concludes that the results about reliability evaluation in the 5GMF revised evaluation report (5D/740) are valid.

However, 5GMF additionally evaluated the reliability performance as shown in Table 1, and other detailed parameters can be found in the revised final evaluation report (Doc. [5D/740](https://www.itu.int/md/R19-WP5D-C-0740/en)) in August 2021.

Table 1

Results for reliability in source 4, 4GHz, with/without phase shift

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| --- | --- | --- | --- |
|  | Value | Meet or not meet the minimum requirement | Note |
| Downlink Reliability with 8T2R | 49.11% (original) | No | without any phase shift, as same as the revised final evaluation report (5D/740) in August 2021 |
| 63.73% | No | additional result assuming that “phase shift” applied |
| Uplink Reliability with 2T8R | 0.68% (original) | No | without any phase shift, as same as the revised final evaluation report (5D/740) in August 2021 |
| 15.99% | No | additional result assuming that “phase shift” applied |

# 3 5GMF Observation

5GMF appreciated very much for elaboration by the proponent on the issue of RS pollution, especially a possibility of the phase shift added to the long preamble in the low error mode. However, 5GMF is of the view that the phase shift is not applied to long preamble in the low error mode according to the EUHT specification (Attachment 5.4 to [5D/222](https://www.itu.int/md/R19-WP5D-C-0222/en)).

Even if phase shift is adopted, there are only four phase shifts for long preamble transmissions of all cells in Urban Macro-URLLC test environment according to the EUHT specification (Attachment 5.4 to 5D/222). Therefore, 5GMF observed in the additional evaluation that for the STA in the serving cell, the neighboring cells could be the cells using the same or different phase shifts compared with the phase shift of serving cell. If the neighboring cells used the same phase shift with the serving cell, it would lead to the complete RS pollution for the STA in the serving cell. The corresponding detailed analysis can be found in Part II D) section 1.4 “EUHT polluted RS in low-error mode for URLLC evaluation” in the 5GMF revised evaluation report (5D/740). Furthermore, even if using the different phase shifts, the multiple paths, propagation delay and etc. would destroy isolation between different phase shifts of one long preamble sequence. This is why that the long preamble of neighboring cells using different phase shifts still pollutes the RS of serving cell, and thus provides the results in Table 1.

# 4 Conclusion

It is concluded that 5GMF does not see any necessary update of the overall conclusion on Reliability after receiving information from the proponent. The conclusion on Reliability in the revised final evaluation report (5D/740) in August 2021 will be valid and applied as the conclusion of Step 4 from 5GMF in WP 5D #39 meeting. 5GMF provides revised compliance template for the relevant KPI of Reliability in Attachment as the conclusion of Step 4 in WP 5D #39 considering the additional evaluation results.

ATTACHMENT

Revised compliance template for Reliability

– Only the relevant KPIs for re-evaluation are shown in the compliance template for technical performance (Section 5.2.4.3 of Report ITU-R M.2411-0) below.

– Additional evaluation by Source 4 assumes the phase shift applied to long preamble.

| Minimum technical performance requirements item (5.2.4.3.x), units, and Report ITU-R M.2410-0 section reference(1) | Category | | | Required value | Value(2) | Requirement met? | Comments (3) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Usage scenario | Test environment | Downlink or uplink |
| 5.2.4.3.11 Reliability *(4.10)* | URLLC | Urban Macro –URLLC | Uplink | 1-10−5 success probability of transmitting a layer 2 PDU (protocol data unit) of size 32 bytes within 1 ms in channel quality of coverage edge | 0.68%~92.37%  (\*) | Yes 🗹 No | For evaluation configuration A (4 GHz), Channel model A.  \* Additional evaluation result is within the range of the original values. |
| Downlink | 49.11%~99.54%  (\*) | Yes 🗹 No | For evaluation configuration of 4 GHz, Channel model A/B.  \* Additional evaluation result is within the range of the original values. |

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1. \* Submitted on behalf of The Fifth Generation Mobile Communications Promotion Forum (5GMF). [↑](#footnote-ref-1)