**3GPP TSG RAN Meeting #88e RP-2xxxxx**

**Electronic Meeting, June 29 – July 3, 2020**

## Status Report to TSG

**Agenda item:** 9.3.5

|  |  |
| --- | --- |
| **WI / SI Name** | Physical Layer Enhancements for NR Ultra-Reliable and Low Latency Communication (URLLC)  |
| included in this status report | Study Item: No | Core part: No | Performance part:Yes | Testing part:No |
| **Acronym** | NR\_L1enh\_URLLC-Perf |
| **Unique ID** | 830074 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-191584 |
| **Target Completion Date****(indicate if changed)** | Study Item: N/A | Core part: N/A | Performance part: 09/2020 | Testing part: N/A |
| **Overall Completion level** | Study Item: N/A | Core part: N/A | Performance Part: 65% | Testing part: N/A |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |
| --- | --- |
| **Leading WG** | TSG RAN WG1 |
| **Rapporteur** | **Name** | Yan Cheng |
| **Company** | Huawei |
| **Email** | chengyan.cheng@huawei.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.
 One time unit (TU) corresponds to ~ 2 hours in the meeting.
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

 NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

#### 2.1.2 Remaining Open issues

## 2.2 RAN2

#### 2.2.1 Agreements

#### 2.2.2 Remaining Open issues

## 2.3 RAN3

#### 2.3.1 Agreements

#### 2.3.2 Remaining Open issues

## 2.4 RAN4

#### 2.4.1 Agreements

**RAN4#94bis-e**

**Demodulation performance requirements**

**R4-2005526 Way Forward on NR URLLC performance requirements with ultra-low BLER**

**Decision: Approved.**

**R4-2005527 Way forward on NR UE URLLC performance requirements**

**Decision: Approved.**

**R4-2005528 Way forward on NR URLLC BS performance requirements**

**Decision: Approved.**

**RAN4#95-e**

**Demodulation performance requirements**

**R4-2008805 Way Forward on ultra-low BLER requirements**

**Decision: Approved.**

**R4-2008807 Way forward on NR UE URLLC performance requirements**

**Decision: Approved.**

**R4-2008808 Simulation assumptions for NR URLLC UE performance requirements**

**Decision: Approved.**

**R4-2008810 Way forward on NR URLLC BS performance requirements**

**Decision: Approved.**

**R4-2008811 Simulation assumptions for NR URLLC BS performance requirements**

**Decision: Approved.**

#### 2.4.2 Remaining Open issues

* Demodulation performance requirements
	+ FFS whether to create URLLC FR2 requirements for ultra-low BLER related for both UE and BS.
	+ FFS whether to create URLLC FR2 requirements for UE high reliability with higher BLER.
	+ FFS whether URLLC UE requirements for Rel-15 features are release independent from Rel-15.
	+ FFS necessity of introduction of RAN4 features and UE applicability for URLLC requirements for Rel-15 features.
	+ FFS BS SCS test applicability for ultra-low BLER test.
	+ FFS test applicability rule for FR1 and FR2 if BS declare to support both FR1 and FR2 for low latency and high reliability with higher BLER.
	+ Performance requirements for UE FR1 URLLC
		- Test configurations for high reliability
			* MCS
			* Methodology for MCS selection
		- Test configurations for low latency
			* Number of HARQ process
			* MCS
			* Pre-emption indication for eMBB UE
				+ Pre-emption probability
				+ MCS
		- CQI reporting requirements for support of CQI table 3
			* Propagation channel
			* Target BLER in case AWGN conditions will be used
			* Test metric
			* FFS whether to introduce test applicable rules among CQI and FMCS test cases if CQI test cases introduced.
	+ Performance requirements for BS FR1 URLLC
		- Test configurations for PUSCH requirements for high reliability with higher BLER
			* PUSCH aggregation factor for 15 kHz SCS.
			* Safety critical aspects clarification in 3GPP specification

## 2.5 RAN5

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

NOTE: This can be e.g. a list of all related Tdocs in the affected WGs since last TSG, references to LSs, produced TRs/TSs, the work/study item description or status reports of previous TSGs.

**RAN4#94bis-e**

1. R4-2002971 View on BS demodulation requirement for URLLC in NR Rel-16 Samsung
2. R4-2003181 Discussion on test method and requirements for Ultra-low BLER Intel Corporation
3. R4-2003182 Discussion on UE performance requirements for URLLC Intel Corporation
4. R4-2003183 Discussion on BS performance requirements for URLLC Intel Corporation
5. R4-2003631 Views on NR BS performance for URLLC NTT DOCOMO, INC.
6. R4-2003678 Discussion on URLLC high reliability test feasibility Huawei, HiSilicon
7. R4-2003679 Discussion and simulation for URLLC UE PDSCH demodulation requirements for high reliability Huawei, HiSilicon
8. R4-2003680 Discussion on URLLC UE performance requirements for low latency for verifying pre-emption Huawei, HiSilicon
9. R4-2003681 Discussion and simulation on URLLC UE performance requirements for verifying PDSCH mapping Type B and processing capabiltiy 2 Huawei, HiSilicon
10. R4-2003682 Discussion on URLLC UE CQI reporting requirements Huawei, HiSilicon
11. R4-2003683 Discussion and simulation for URLLC BS PUSCH demodulation requirements for high reliability Huawei, HiSilicon
12. R4-2003684 Discussion and simulation on URLLC BS performance requirements for low latency Huawei, HiSilicon
13. R4-2003727 New WID on UE performance for advanced recevier with soft IC for inter-stream interference and IRC for inter-cell interference Huawei, HiSilicon
14. R4-2003728 Motivation paper of new WID on UE performance for advanced recevier with soft IC for inter-stream interference and IRC for inter-cell interference Huawei, HiSilicon
15. R4-2003826 Discussion on CQI reporting requirements for URLLC Ericsson
16. R4-2003827 Discussion on pre-emption indication Ericsson
17. R4-2003828 Views on UE URLLC performance requirements for Slot Aggregation Ericsson
18. R4-2003829 Views on UE URLLC performance requirements for Type B and PDSCH capability 2 Ericsson
19. R4-2003842 URLLC ultra-low BLER test Ericsson
20. R4-2003843 URLLC BS reliability related requirement Ericsson
21. R4-2003844 URLLC BS latency related requirement Ericsson
22. R4-2003845 On FR1 and FR2 for URLLC Ericsson
23. R4-2003900 On NR Rel-16 high reliability BS demodulation test feasibility and methodology Nokia, Nokia Shanghai Bell
24. R4-2003901 On NR Rel-16 relaxed high reliability and low latency BS demodulation requirements Nokia, Nokia Shanghai Bell
25. R4-2004010 Views on UE demodulation requirements for URLLC NTT DOCOMO, INC.
26. R4-2004557 Views on URLLC Test Feasibility Qualcomm Incorporated
27. R4-2004781 Views on URLLC Test Cases Qualcomm Incorporated

**RAN4#95-e**

1. R4-2006060 On NR Rel-16 high reliability BS demodulation test feasibility and requirements Nokia, Nokia Shanghai Bell
2. R4-2006061 NR Rel-16 non-relaxed high reliability BS demodulation requirement simulation results Nokia, Nokia Shanghai Bell
3. R4-2006062 On NR Rel-16 relaxed high reliability and low latency BS demodulation requirements Nokia, Nokia Shanghai Bell
4. R4-2006207 On UE demodulation and CSI requirements with Ultra-low BLER Apple
5. R4-2006208 On UE demodulation and CSI requirements with higher BLER Apple
6. R4-2006325 Discussion and initial simulation results for URLLC ultra-low BLER requirement Samsung
7. R4-2006326 View on remain issues for URLLC performance requirements in NR Rel-16 Samsung
8. R4-2006526 Discussion on URLLC requirements for Ultra-low BLER Intel Corporation
9. R4-2006527 Discussion on UE performance requirements for URLLC Intel Corporation
10. R4-2006528 Discussion on BS performance requirements for URLLC Intel Corporation
11. R4-2006582 NR Rel-16 relaxed high reliability and low latency BS demodulation requirement simulation results Nokia, Nokia Shanghai Bell
12. R4-2006656 Views on URLLC Ultra-low BLER Test Cases Qualcomm Incorporated
13. R4-2007141 Views on UE demodulation for URLLC requirements NTT DOCOMO, INC.
14. R4-2007187 Views on NR BS performance for ultra-low BLER NTT DOCOMO, INC.
15. R4-2007188 Views on NR BS performance for high-reliability and low-latency NTT DOCOMO, INC.
16. R4-2007190 Discussion and simulation on URLLC UE high reliability with ultra-low BLER Huawei, HiSilicon
17. R4-2007191 Discussion and simulation on URLLC BS high reliability with ultra-low BLER Huawei, HiSilicon
18. R4-2007192 Discussion and simulation on URLLC UE PDSCH demodulation requirements for high reliability with higher BLER Huawei, HiSilicon
19. R4-2007193 Discussion and simulation on URLLC UE performance requirements for PDSCH mapping Type B and processing capabiltiy 2 Huawei, HiSilicon
20. R4-2007194 Discussion on URLLC UE performance requirements for low latency for pre-emption Huawei, HiSilicon
21. R4-2007195 Discussion on URLLC UE CQI reporting requrements Huawei, HiSilicon
22. R4-2007196 Discussion and simulation on URLLC BS PUSCH demodulation requirements for high reliability with higher BLER Huawei, HiSilicon
23. R4-2007197 Discussion and simulation on URLLC BS performance requirements for low latency Huawei, HiSilicon
24. R4-2007362 URLLC in BS specifications Ericsson
25. R4-2007363 URLLC BS demod rquirements Ericsson
26. R4-2007364 URLLC BS ultra-low BLER test Ericsson
27. R4-2007593 Discussion on URLLC UE requirements applicability Intel Corporation
28. R4-2007801 Views on URLLC High BLER Test Cases Qualcomm Incorporated
29. R4-2007929 Discussion on UE performance requirements for Pre-emption Ericsson
30. R4-2007930 Discussion on UE URLLC performance requirements for Slot Aggregation Ericsson
31. R4-2007931 URLLC UE test applicability and specification layout Ericsson
32. R4-2007932 Views on UE URLLC performance requirements for Type B and PDSCH capability 2 Ericsson
33. R4-2007933 Discussion on UE URLLC performance requirements for Ultra low BLER Ericsson

 12.05.2019 minor adaptations for RAN #84

 27.02.2019 minor adaptations for RAN #83

 21.11.2018 completion levels with colours added (for RAN #82)

v04.81 31.07.2018 simplification of template and addition of cross-TSG aspects (for RAN #81)

v04.80 21.05.2018 minor adaptations for RAN #80

v04.79 26.02.2018 minor adaptations for RAN #79

v04.78 18.11.2017 minor adaptations for RAN #78

v04.77 06.08.2017 minor adaptations for RAN #77

v04.76 15.05.2017 minor adaptations for RAN #76

v04.75 31.01.2017 minor adaptations for RAN #75

v04.74 28.10.2016 minor adaptations for RAN #74

v04.73 01.09.2016 adaptations for RAN #73 (time units in extra Excel table, RAN6 reporting included)

v04.72 26.05.2016 adaptations for RAN #72 (introduction of NR & GERAN TUs)

v04.71 10.02.2016 minor adaptations for RAN #71

v04.70 30.10.2015 minor adaptations for RAN #70

v04.69 12.08.2015 minor adaptations for RAN #69

v04.68 21.05.2015 minor adaptations for RAN #68

v04.67 01.02.2015 minor adaptations for RAN #67

v04.66 16.11.2014 minor adaptations for RAN #66

v04.65 16.08.2014 minor adaptations for RAN #65

v04.64 22.05.2014 minor adaptations for RAN #64

v04.63 24.01.2014 restructuring for RAN #63 to cover Core & Perf. in one doc file

v03.62 11.11.2013 section 1.2.3 adapted for RAN #62

v03 11.08.2013 section 1.2.3 added on time budget

v02 07.05.2010 history added, some spelling corrections

v01 13.11.2009 First version of the template