**3GPP TSG RAN meeting #109 RP-25xxxx**

**Beijing, China, September 15-18, 2025**

## Status Report to TSG

**Agenda item:** xxx

|  |  |
| --- | --- |
| **WI / SI Name** |  |
| included in this status report | Study Item: Yes | Core part: No | Performance part:No | Testing part:No |
| **Acronym** | FS\_NR\_AIML\_air\_Ph2 |
| **Unique ID** | 1020093 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-xxxxxxx |
| **Target Completion Date****(indicate if changed)** | Study Item: Sept ‘25 | Core part: NA | Performance part: NA | Testing part: NA |
| **Overall Completion level** | Study Item: 100% | Core part: NA | Performance Part: NA | Testing part: NA |

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** | Juan Montojo (RAN1); Xiaofeng Liu (RAN4); Marco Belleschi (RAN2/RAN3) |
| **Company** | Qualcomm; CAICT; Ericsson |
| **Email** | juanm@qti.qualcomm.com; liuxiaofeng1@caict.ac.cn; marco.belleschi@ericsson.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

In RAN2#131, RAN2 endorsed two TPs for the TR38.843, in R2-2506457 and R2-2505937. The TPs contain updates related to the topics of UE-side data collection and dataset/model parameters sharing for the two-sided models.
RAN2 finally sent an LS to RAN1 (R2-2506474) informing RAN1 about the two endorsed TPs and asking RAN1 to include them in the TR 38.843.

#### 2.2.2 Remaining Open issues

No other issues were agreed to be further studied.

## 2.3 RAN3

#### 2.3.1 Agreements

#### 2.3.2 Remaining Open issues

## 2.4 RAN4

#### 2.4.1 Agreements

##### 2.4.1.1 RAN4#116

**Topic 1: Two sided CSI study item**

**Simulation results for low complexity encoders**

**Agreement:**

The following observations were agreed about the low-complexity/alternative backbone encoder simulations performed between RAN4#115 and RAN4#116:

* + It is important to differentiate in this evaluation between the impacts of different encoder backbones and the impacts of different complexity levels
	+ The following observations are valid with the mixed dataset; there can be dataset dependency for other datasets
	+ 1-1 joint training:
		- For 1-1 joint training, some, although not all, companies observed that the low complexity MLP encoder (Encoder 4) had a reduced performance compared to the other encoders.
	+ Training based on the Samsung frozen decoder
		- When trained using the Samsung Frozen decoder, many, although not all, companies observed that the MLP encoder had a loss compared to the other encoders
		- One company saw SGCS loss for all of the low complexity encoders (Transformer, CNN and MLP) when trained with the Samsung frozen encoder.
		- Based on the majority company results, it might be concluded that the lower complexity transformer and CNN encoders are compatible with the Samsung frozen decoder (which was trained using the agreed “high complexity” encoder), but the MLP may not be.
	+ Training based on N-1 decoder
		- It is proposed to name training based on the N-1 decoder as “N-to-1 Multi-encoder structure aware training”
		- With N-to-1 Multi-encoder structure aware training, most companies observed that the performance of the MLP low complexity encoder could improve relative to the other encoders (depending on company, possibly still a slight loss)
		- One company observed that if lower complexity CNN encoders are used with N-1 joint training then the SGCS becomes lower for the low complexity CNN encoders.
		- One company observed that the choice of anchor and method used to train the N-to-1 Multi-encoder structure aware training may impact the performance and capability with different encoders.
	+ Summary conclusion:
		- If a high complexity test decoder is used, it seems to be compatible with different encoder backbones (at least CNN and transformer)
			* Whether a low complexity decoder can be compatible with different encoder structures was not studied
		- The benefits of N-to-1 Multi-encoder structure aware training are not fully clear, however it may improve the performance of the lowest complexity MLP encoder

**Criteria for selecting the encoder/decoder model:**

Agreements:

* + Achievable performance, complexity and robustness in different conditions need to be taken into account in selecting the model.
	+ Whether a single or multiple test decoders is needed will need more elaboration during the WI phase
	+ For option 3 the reference encoder should have been joint trained with the test decoder.

**Number of requirements to create:**

There was some discussion whether, considering that there might be different backbone / lower complexity encoders, there should be a “tiered” set of requirements for the same side conditions relating to different encoder complexity.

Agreement:

 Agree a minimum performance requirement level per set of side conditions during Rel-20 WI

**Further observation on option 4:**

Agreement.

* + Option 4 can work as long as the decoder structure is fully specified and the same dataset is used by all TE vendors and 3GPP.
		- Some validation of the TE decoder may be needed

Note that option 3 is selected for the follow-on WI.

**Topic 2: Guidance for the WI discussion for 2-sided CSI**

The following were noted as issues needing discussion during the WI. They are not agreements, but companies are encouraged to contribute on these topics:

* + - Discuss and align on the dataset assumptions and dataset
		- Discuss and align on assumptions for the test decoder and reference encoder structures
			* Also may need to consider how many test decoders and encoders
		- Discuss and align on the scalability alternatives
* Discuss and agree on expectations on whether the decoder/encoder for RAN4 are the same as for option C
	+ - * Discuss whether to decide this before or after agreeing the model
* Develop a means to capture model structures and model parameters in 3GPP
* Discuss and agree the test metric for the performance requirements.
* Discuss and agree channel model for the requirements.
	+ For the dataset, discuss the following:
		- Eigenvectors or raw channel (or both) ?
		- What it is important to capture within the dataset
		- metrics for checking alignment
			* For example,. PSE
			* Consider examples from SI datasets that did not align

**Topic 3: LCM**

**General LCM principles:**

Agreement:

* No need to create deactivation requirements for AI functionality

**LCM for beam management:**

Agreement:

* Do not define performance monitoring delay requirements for LCM purpose
	+ If the monitoring delay is identificated as critical in the future, this issue can be revisited.

No agreements on performance monitoring accuracy.

**Post-deployment handling:**

No further agreements on post-deployment handling

#### 2.4.2 Remaining Open issues

None

## 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.

## 4.1 RAN1

## 4.2 RAN2

### 4.2.1 RAN2#131

11 contributions (for details see agenda items 8.1.4, 8.1.5 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/TDoc_List_Meeting_RAN2%23131.xlsx))

## 4.3 RAN4

#### 4.3.1 RAN4#116

// **General aspects**

[**R4-2509429**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509429.zip) **Discussion on General Aspects of AI/ML for NR Air Interface Phase 2**

 *Type: discussion For: Discussion
 Source: Apple*

**Decision: Noted.**

[**R4-2509930**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509930.zip) **Discussion on General Aspects of AI/ML for NR Air Interface Phase 2**

 *Type: discussion For: Discussion
 Source: Nokia*

**Decision: Noted.**

[**R4-2510136**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510136.zip) **On General Aspects-Deployment post-activation functionality testing based on performance monitoring**

 *Type: discussion For: Discussion
 Source: Korea Testing Laboratory*

**Decision: Noted.**

[**R4-2510165**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510165.zip) **Discussion on general aspects for study on AI/ML for NR air interface Phase 2**

 *Type: discussion For: Discussion
 Source: CMCC*

**Decision: Noted.**

[**R4-2510241**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510241.zip) **Proposed update for TR 38.843 with RAN4 part**

 *Type: discussion For: Discussion
 Source: CAICT.*

**Decision: Noted.**

[**R4-2510341**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510341.zip) **Discussion on general aspects for AI/ML for NR air interface Phase 2**

 *Type: discussion For: Discussion
 Source: vivo*

**Decision: Noted.**

[**R4-2510877**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510877.zip) **Discussion on general aspects on AIML for NR air interface phase 2**

 *Type: discussion For: Discussion
 Source: Huawei,HiSilicon*

**Decision: Noted.**

**//** **Testing issues for CSI compression two-sided models**

[**R4-2509241**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509241.zip) **Decoder Selection Criterion Based on AI/ML Interoperability from Standardization of Testing and Verification Perspective**

 *Type: discussion For: Approval
 Source: NTU*

**Decision: Noted.**

[**R4-2509301**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509301.zip) **Discussion on testing issues for CSI compression two-sided models**

 *Type: discussion For: Discussion
 Source: CATT*

**Decision: Noted.**

[**R4-2509430**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509430.zip) **Discussion on the 2-sided CSI study**

 *Type: discussion For: Discussion
 Source: Apple*

**Decision: Noted.**

[**R4-2509656**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509656.zip) **Discussion on Testing issues for CSI compression two-sided models**

 *Type: discussion For: Discussion
 Source: MediaTek inc.*

**Decision: Noted.**

[**R4-2509931**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509931.zip) **Discussion on Testing Issues for CSI Compression Two-sided Models**

 *Type: discussion For: Discussion
 Source: Nokia*

**Decision: Noted.**

[**R4-2510166**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510166.zip) **Discussion on testing issues for CSI compression two-sided models**

 *Type: discussion For: Discussion
 Source: CMCC*

**Decision: Noted.**

[**R4-2510184**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510184.zip) **CSI compression on Low-Complexity Encoders under SGCS-4**

 *Type: discussion For: Discussion
 Source: Korea Testing Laboratory*

**Decision: Noted.**

[**R4-2510342**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510342.zip) **Discussion on testing issues for CSI compression two-sided models**

 *Type: discussion For: Discussion
 Source: vivo*

**Decision: Noted.**

[**R4-2510810**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510810.zip) **Testing issues for CSI compression two-sided models**

 *Type: discussion For: Approval
 Source: OPPO*

**Decision: Noted.**

[**R4-2510837**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510837.zip) **Discussion on the 2-sided CSI study**

 *Type: discussion For: Discussion
 Source: Ericsson*

**Abstract:**

This contribution discuss the open issues on CSI compression with 2-sided model.

**Decision: Noted.**

[**R4-2510878**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510878.zip) **Discussion on testing issues for CSI compression two-sided models**

 *Type: discussion For: Discussion
 Source: Huawei,HiSilicon*

**Decision: Noted.**

[**R4-2510989**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510989.zip) **Discussion on Testing issues for CSI compression two-sided models**

 *Type: other For: Approval
 Source: ZTE Corporation, Sanechips*

**Decision: Noted.**

[**R4-2511248**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2511248.zip) **Study on remaining issues for CSI compression two-sided models**

 *Type: other For: Approval
 Source: Samsung*

**Decision: Noted.**

[**R4-2511571**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2511571.zip) **CSI Compression: Testability and Interoperability**

 *Type: discussion For: Discussion
 Source: Qualcomm Incorporated*

**Decision: Noted.**

**// Moderator summary and conclusions**

[**R4-2509099**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509099.zip) **Topic summary for [116][132] NR\_AIML\_air\_part2**

 *Type: other For: Information
 Source: Moderator (Ericsson)*

**Abstract:**

Topic summary Main session

**Decision: Noted.**

**Minutes and agreements in the online session and ad hoc**

Please refer to the hyperlink below for the detailed minutes of online session:

[R4-2509099](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2509099.zip)

[**R4-2511849**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2511849.zip) **WF on [116][132] NR\_AIML\_air\_part2**

 *Type: other For: Approval
 Source: Ericsson*

**Decision: Approved.**

[**R4-2511886**](http://10.10.10.10/ftp/RAN/RAN4/Inbox/R4-2511886.zip) **LS on TP for TR 38.843 with RAN4 part**

 *Type: LSOUT For: Approval
 Source: CAICT, NTU, Ericsson, Qualcomm, APPLE, Huawei, Hisilicon, OPPO, CATT, CMCC, NTT DOCOMO, INC., Vivo, NTU, Nokia, Xiaomi, Mediatek, Rohde & Schwarz, Samsung, Intel, ZTE Corporation, Sanechips, Korea Testing Laboratory*

**Decision: Approved.**

[**R4-2511887**](http://10.10.10.10/ftp/RAN/RAN4/Inbox/R4-2511887.zip) **Proposed update for TR 38.843 with RAN4 part**

 *Type: other For: Approval
 Source: CAICT*

**Decision: Approved.**

[**R4-2511893**](http://10.10.10.10/ftp/RAN/RAN4/Inbox/R4-2511893.zip) **AH minutes for AI for air interface [116][132]**

 *Type: other For: Information
 Source: Moderator (Ericsson)*

**Abstract:**

This contribution provides the summary of topics and recommended summary.

**Decision: Noted.**

[**R4-2511769**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2511769.zip) **Proposed update TR 38.843 AI CSI compression simulation results**

 *Type: other For:
 38.xxx-0y-0y vx.y.z CR- rev Cat: (Rel-18)

 Source: Huawei*

**Decision: Endorsed.**

[**R4-2510879**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510879.zip) **Discussions on TP for TR 38.843 (RAN4 part on simulation results for AI CSI compression)**

 *Type: discussion For: Discussion
 Source: Huawei,HiSilicon*

**Decision: Noted.**

[**R4-2510880**](file:////Users/yangtang/Documents/work/RAN4/WG%20meetings/116/Docs/R4-2510880.zip) **Collection of simulation results on CSI compression**

 *Type: discussion For: Information
 Source: Huawei,HiSilicon*

**Decision: Noted.**

 16.02.2024 minor adaptations for RAN #103

 10.11.2023 minor adaptations for RAN #102

 02.08.2023 minor adaptations for RAN #101

 26.04.2023 minor adaptations for RAN #100

 01.02.2023 minor adaptations for RAN #99

 27.10.2022 minor adaptations for RAN #98e

 01.08.2022 minor adaptations for RAN #97e

 21.05.2022 minor adaptations for RAN #96

 10.01.2022 minor adaptations for RAN #95e

 04.10.2021 minor adaptations for RAN #94e

 08.08.2021 minor adaptations for RAN #93e

 17.05.2021 minor adaptations for RAN #92e

 28.01.2021 minor adaptations for RAN #91e

 09.11.2020 minor adaptations for RAN #90e

 31.08.2020 minor adaptations for RAN #89e

 20.04.2020 minor adaptations for RAN #88e

 18.02.2020 minor adaptations for RAN #87e

 14.11.2019 minor adaptations for RAN #86

 18.08.2019 minor adaptations for RAN #85

 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