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| **Radiocommunication Study Groups** |  |
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| **3 December 2019** |
| **English only** |
|  | **TECHNOLOGY ASPECTS** |
| Director, Radiocommunication Bureau[[1]](#footnote-1) | |
| ChEG final evaluation report on submissionS   (IMT-2020/13, IMT-2020/14, IMT-2020/15, IMT-2020/16) | |
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# 1 **Introduction**

On the previous ITU-R WP 5D meeting, ChEG shared workplan and some preliminary calibrations information as informative materials and received valuable feedbacks. Following IMT-2020 development process and in responding to WP 5D’s liaison, Chinese Evaluation Group (ChEG) is pleased to provide its final evaluation report to the WP 5D #33 meeting.

# 2 Administrative aspects of the Independent Evaluation Group:

## 2.1 Name of the Independent Evaluation Group;

Chinese Evaluation Group (ChEG).

## 2.2 Background of the Independent Evaluation Group;

The Chinese Evaluation Group (ChEG) is built under the structure of IMT-2020(5G) Promotion Group. The Promotion Group is established as anon-profit association, founded under Chinese law, with its seat in Beijing, China. The Promotion Group works on 5G research & development, pre-standardization activities, spectrum issues, technical scheme evaluation, and technical trials.

The major task of ChEG includes: register and participate in ITU independent evaluation activity for formal results submission.

Some of the members will participate in the Group's evaluation activities are as follows:

– China Academy of Information and Communications Technology

– China Mobile Communications Corporation

– China Telecommunications Corporation

– China Unicom

– China Information Communication Technologies Group Corporation (CATT)

– Huawei Technologies Co., Ltd.

– OPPO

– VIVO

– ZTE Corporation

– Beijing University of Posts and Telecommunications,

ChEG has participated in developing IMT related systems since early stages, e.g. IMT-2000 evaluation in 1998, OFDMA TDD WMAN evaluation in 2007 and IMT-Advanced evaluation in 2010. At the end of 2017, ChEG revived as an independent evaluation group for evaluation of   
IMT-2020 candidate submission.

ChEG follows the guidelines of the ITU IMT-2020 process. Currently ChEG is working on evaluation of submissions in Docs. IMT-2020/13, IMT-2020/14, IMT-2020/15, IMT-2020/16,

## 2.3 Method of Work

From the year 2017, ChEG joined face to face meetings and workshops. Through these meetings, members of ChEG have opportunities to discuss and reach consensus on parameter assumption, calibration, evaluation methodologies and other issues which are related to evaluation tasks. More importantly, ChEG participated in several meeting and workshops from ITU-R and 3GPP with proponents and IEGs, to clarify technical details and exchange knowledge of evaluation.

The assessments reported are performed using three methods, i.e., inspection, analysis and simulation which are suggested in M.2412. Some additions, such as simulation assumptions provided by 3GPP, are also considered in this report.

## 2.4 Administrative contact details;

Name: Mr. WAN Yi, from China Academy of Information and Communication Technology (CAICT), of MIIT

Email: [yi.wan@ties.itu.int](mailto:yi.wan@ties.itu.int); [wanyi@ritt.cn](mailto:wanyi@ritt.cn);

TEL：86-10-62300182

FAX：86-10-62300178

## 2.5 Technical contact details;

Name: Mr. WAN Yi

Email: [wanyi@caict.ac.cn](mailto:wanyi@caict.ac.cn)

Name: Ms. XU Xiaoyan

Email: [xuxiaoyan@caict.ac.cn](mailto:xuxiaoyan@caict.ac.cn)

# 3 Technical aspects of the work of the Independent Evaluation Group

## What candidate technologies or portions of the candidate technologies this IEG is or might anticipate evaluating?

This contribution is the final evaluation report on the submissions in Docs. IMT-2020/13,   
IMT-2020/14, IMT-2020/15, IMT-2020/16, including 3GPP NR RIT and SRIT, China submission, Korea submission.

## Confirmation of utilization of the ITU-R evaluation guidelines in Report ITU‑R M.2412;

ChEG confirms that the evaluation reported in this contribution is performed in accord with in Report ITU‑R M.2412. The evaluation methodologies and configurations used for each minimum requirement are chosen according to Table 8-2 in Report ITU-R M.2412.

Other details used in this contribution are in accord with Docs. IMT-2020/13, IMT-2020/14,   
IMT-2020/15, IMT-2020/16, which are submissions from the proponents.

## Verification as per Report ITU-R M.2411 of the compliance templates and the self-evaluation for each candidate technology as indicated in A).

ChEG identifies that the technology submissions in Docs. IMT-2020/13, IMT-2020/14, IMT-2020/15, IMT-2020/16 include complete compliance templates for service, spectrum and technical performance as specified in Chapter 4.2.4 of Report ITU-R M.2411. In additional, ChEG identifies that the technology submissions also include material for independent evaluation.

## Assessment as per Reports ITU-R M.2410, ITU-R M.2411 and ITU-R M.2412 for each candidate technology as indicated in A).

### D.1 Initial assessment and evaluation results on NR RIT (Submission 2) of 3GPP 5G

#### D.1.1 Compliance template for services

|  |  |  |
| --- | --- | --- |
|  | Service capability requirements | ChEG’s comments |
| **5.2.4.1.1** | **Support for wide range of services**  Is the proposal able to support a range of services across different usage scenarios (eMBB, URLLC, and mMTC)?: 🗹YES / NO  Specify which usage scenarios (eMBB, URLLC, and mMTC) the candidate RIT or candidate SRIT can support.(1) | The assessment of service requirement follows the evaluation method as defined in Section 7.3.3 in Report ITU-R M.2412.  The candidate RIT NR can support eMBB, URLLC and mMTC usage scenarios. |
| (1) Refer to the process requirements in IMT-2020/2. | | |

#### D.1.2 Compliance template for spectrum

|  |  |  |
| --- | --- | --- |
|  | Spectrum capability requirements | ChEG’s comments |
| **D.1.2.1** | **Frequency bands identified for IMT**  Is the proposal able to utilize at least one frequency band identified for IMT in the ITU Radio Regulations?:  Specify in which band(s) the candidate RIT or candidate SRIT can be deployed.  🗹YES / NO | The supported frequency bands identified for IMT are provided in item 5.2.3.2.8.3 in characteristics template for NR RIT. See the table for frequency range 1 (FR1). |
| **D.1.2.2** | **Higher Frequency range/band(s)**  Is the proposal able to utilize the higher frequency range/band(s) above 24.25 GHz?:  Specify in which band(s) the candidate RIT or candidate SRIT can be deployed.  NOTE 1 – In the case of the candidate SRIT, at least one of the component RITs need to fulfil this requirement.  🗹YES / NO | The supported frequency bands above 24.25 GHz are provided in item 5.2.3.2.8.3 in characteristics template for NR RIT. See the table for frequency range 2 (FR2). |

#### D.1.3 Compliance template for technical performance

Detailed results, configurations and specific assumptions can be found in the Annex 2.

| 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? | ChEG’s Comments |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Usage scenario | Test environment | Downlink or  uplink |
| **5.2.4.3.1** Peak data rate (Gbit/s) *(4.1)* | eMBB | Not applicable | Downlink | 20 | 21.1~125.0 | Yes | The values are achieved by using 16 carrier aggregations.  As described in 3GPP TR 37.910 sub clause 5.2.1 |
| Uplink | 10 | 16.8~61.6 | Yes |
| **5.2.4.3.2** Peak spectral efficiency (bit/s/Hz) *(4.2)* | eMBB | Not applicable | Downlink | 30 | 30.4~48.9 | Yes | As described in 3GPP TR 37.910 sub clause 5.1.1 |
| Uplink | 15 | 18.2~25.8 | Yes |
| **5.2.4.3.3** User experienced data rate (Mbit/s) *(4.3)* | eMBB | Dense Urban – eMBB | Downlink | 100 | 100.87~149.29 | Yes | For evaluation configuration A (4 GHz) and C (multi-band/layer), Channel model A/B. |
| Uplink | 50 | 50.06~73.15 | Yes |
| **5.2.4.3.4** 5th percentile user spectral efficiency (bit/s/Hz) *(4.4)* | eMBB | Indoor Hotspot – eMBB | Downlink | 0.3 | 0.33~0.59 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, with 12 TRxP and 36 TRxP. |
| Uplink | 0.21 | 0.39~0.63 | Yes |
| Downlink | 0.3 | 0.31~1.18 | Yes | For evaluation configuration B (30 GHz), Channel model A/B, with 12 TRxP and 36 TRxP. |
| Uplink | 0.21 | 0.32~0.4 | Yes |
| eMBB | Dense Urban – eMBB | Downlink | 0.225 | 0.38~0.81 | Yes | For evaluation configuration A (4 GHz), Channel model A/B. |
| Uplink | 0.15 | 0.22~0.60 | Yes |
| eMBB | Rural – eMBB | Downlink | 0.12 | 0.14~0.32 | Yes | For evaluation configuration A (700 MHz), Channel model A/B. |
| Uplink | 0.045 | 0.09~0.43 | Yes |
| Downlink | 0.12 | 0.37~0.71 | Yes | For evaluation configuration B (4 GHz), Channel model A/B. |
| Uplink | 0.045 | 0.09~0.34 | Yes |
| **5.2.4.3.5** Average spectral efficiency (bit/s/Hz/ TRxP) *(4.5)* | eMBB | Indoor Hotspot – eMBB | Downlink | 9 | 11.03~16.88 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, with 12 TRxP and 36 TRxP. |
| Uplink | 6.75 | 6.95~15.17 | Yes |
| Downlink | 9 | 12.11~19.91 | Yes | For evaluation configuration B (30 GHz), Channel model A/B, with 12 TRxP and 36 TRxP. |
| Uplink | 6.75 | 7.04~7..44 | Yes |
| eMBB | Dense Urban – eMBB | Downlink | 7.8 | 9.51~22.33 | Yes | For evaluation configuration A (4 GHz), Channel model A/B. |
| Uplink | 5.4 | 5.69~8.83 | Yes |
| eMBB | Rural – eMBB | Downlink | 3.3 | 5.04~12.64 | Yes | For evaluation configuration A (700 MHz), Channel model A/B. |
| Uplink | 1.6 | 3.75~5.99 | Yes |
| Downlink | 3.3 | 12.97~21.44 | Yes | For evaluation configuration B (4 GHz), Channel model A/B. |
| Uplink | 1.6 | 2.7~7.83 | Yes |
| Downlink | 3.3 | 7.35~11.02 | Yes | For evaluation configuration C (LMLC), Channel model A/B. |
| Uplink | 1.6 | 3.31~4.41 | Yes |
| **5.2.4.3.6** Area traffic capacity (Mbit/s/m2) *(4.6)* | eMBB | Indoor-Hotspot – eMBB | Downlink | 10 | 10.00~15.04 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, with 12 TRxP and 36 TRxP. |
| Downlink | 10 | 11.54~22.76 | Yes | For evaluation configuration B (30 GHz), Channel model A/B, with 12 TRxP and 36 TRxP. |
| **5.2.4.3.7** User plane latency (ms) *(4.7.1)* | eMBB | Not applicable | Downlink | 4 | 0.28~3.19 | Yes | As described in 3GPP TR 37.910 sub clause 5.7.1.1 |
| Uplink | 4 | 0.28~3.84 | Yes |
| URLLC | Not applicable | Downlink | 1 | 0.23~0.99 | Yes |
| Uplink | 1 | 0.24~0.98 | Yes |
| **5.2.4.3.8** Control plane latency (ms) *(4.7.2)* | eMBB | Not applicable | Not applicable | 20 | 11.3~18.8 | Yes | As described in 3GPP TR 37.910 sub clause 5.7.2.1 |
| URLLC | Not applicable | Not applicable | 20 | 11.3~18.8 | Yes |
| **5.2.4.3.9** Connection density (devices/km2) *(4.8)* | mMTC | Urban Macro – mMTC | Uplink | 1 000 000 | 36,008,000/ 180 kHz~ 36,324,000/ 180 kHz | Yes | For evaluation configuration A (ISD=500m) with full buffer system level simulation followed by link level simulation; Channel model A/B. |
| Uplink | 1 000 000 | 1,267,000 / 180 kHz~ 1,503,000 / 180 kHz | Yes | For evaluation configuration B (ISD=1732m) with full buffer system level simulation followed by link level simulation; Channel model A/B. |
| **5.2.4.3.10** Energy efficiency *(4.9)* | eMBB | Not applicable | Not applicable | Capability to support a high sleep ratio and long sleep duration | Sleep ratio: 80%~99.87%  Sleep duration:  Up to 159ms | Yes | Network side  As described in 3GPP TR 37.910 sub clause 5.8.1.1 |
| Sleep ratio: 84.2%~99.5%  Sleep duration:  2.56s~10.24s | Yes | Device side  As described in 3GPP TR 37.910 sub clause 5.8.2.1 |
| **5.2.4.3.11** Reliability *(4.10)* | URLLC | Urban Macro –URLLC | Downlink | 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 | 99.999899%~ 99.99991% | Yes | For evaluation configuration A (4 GHz), Channel model A/B. |
| Downlink | 99.9994%~ 99. 9998% | Yes | For evaluation configuration B (700 MHz), Channel model A/B. |
| Uplink | 99.9992%~ 99.99999964% | Yes | For evaluation configuration A (4 GHz), Channel model A/B. |
| Uplink | 99.9992%~ 99.99999999% | Yes | For evaluation configuration B (700 MHz), Channel model A/B. |
| **5.2.4.3.12** Mobility classes *(4.11)* | eMBB | Indoor Hotspot – eMBB | Uplink | Stationary, Pedestrian | Stationary, Pedestrian | Yes | For evaluation configurations A (4 GHz) and B (30 GHz) in Indoor Hotspot – eMBB. |
| eMBB | Dense Urban – eMBB | Uplink | Stationary, Pedestrian,  Vehicular (up to 30 km/h) | Stationary, Pedestrian,  Vehicular (up to 30 km/h) | Yes | For evaluation configurations A (4 GHz) and B (30 GHz) in Dense Urban – eMBB |
| eMBB | Rural – eMBB | Uplink | Pedestrian, Vehicular, High speed vehicular | Pedestrian, Vehicular, High speed vehicular | Yes | For evaluation configurations A (700 MHz) and B (4 GHz) in Rural - eMBB |
| **5.2.4.3.13**  Mobility Traffic channel link data rates (bit/s/Hz) *(4.11)* | eMBB | Indoor Hotspot – eMBB | Uplink | 1.5 (10 km/h) | 1.59~3.85 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, LOS and NLOS. |
| eMBB | Dense Urban – eMBB | Uplink | 1.12 (30 km/h) | 1.79~4.72 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, LOS and NLOS. |
| eMBB | Rural – eMBB | Uplink | 0.8 (120 km/h) | 1.45~3.18 | Yes | For evaluation configuration A (700 MHz), Channel model A/B, LOS and NLOS. |
| 0.45 (500 km/h) | 1.21~2.64 | Yes |
| 0.8 (120 km/h) | 1.16~2.68 | Yes | For evaluation configuration B (4 GHz), Channel model A/B, LOS and NLOS.  . |
| 0.45 (500 km/h) | 0.83~1.56 | Yes |
| **5.2.4.3.14** Mobility interruption time (ms)  *(4.12)* | eMBB and URLLC | Not applicable | Not applicable | 0 | 0 | Yes | As described in 3GPP TR 37.910 sub clause 5.10.1.1 |
| **5.2.4.3.15** Bandwidth and Scalability *(4.13)* | Not applicable | Not applicable | Not applicable | At least 100 MHz | 800 MHz ~ 6.4 GHz | Yes | As described in 3GPP TR 37.910 clause 8 |
| Up to 1 GHz | Yes |
| Support of multiple different bandwidth values(4) | 3~13 different component carrier bandwidth values | Yes |
| (1) As defined in [Report ITU-R M.2410-0](https://www.itu.int/pub/R-REP-M.2410).  (2) According to the evaluation methodology specified in Report ITU-R M.2412-0.  (3) Refer to § 7.3.1 of [Report ITU-R M.2412-0](https://www.itu.int/pub/R-REP-M.2412). | | | | | | | |

## D.2 Initial assessment and evaluation results on SRIT (Submission1) of 3GPP 5G

#### D.2.1 Compliance template for services

|  |  |  |
| --- | --- | --- |
|  | Service capability requirements | ChEG’s comments |
| **5.2.4.1.1** | **Support for wide range of services**  Is the proposal able to support a range of services across different usage scenarios (eMBB, URLLC, and mMTC)?: 🗹YES / NO  Specify which usage scenarios (eMBB, URLLC, and mMTC) the candidate RIT or candidate SRIT can support.(1) | The assessment of service requirement follows the evaluation method as defined in Section 7.3.3 in Report ITU-R M.2412.  The candidate SRIT can support eMBB, URLLC and mMTC usage scenarios. |
| (1) Refer to the process requirements in IMT-2020/2. | | |

#### D.2.2 Compliance template for spectrum

|  |  |  |
| --- | --- | --- |
|  | Spectrum capability requirements | ChEG’s comments |
| **D.2.2.1** | **Frequency bands identified for IMT**  Is the proposal able to utilize at least one frequency band identified for IMT in the ITU Radio Regulations?:  Specify in which band(s) the candidate RIT or candidate SRIT can be deployed.  🗹YES / NO | The supported frequency bands identified for IMT by NR and LTE component RIT are provided in item 5.2.3.2.8.3 in characteristics template for SRIT. See the table for frequency range 1 (FR1) for NR component RIT, and the table for LTE component RIT. |
| **D.2.2.2** | **Higher Frequency range/band(s)**  Is the proposal able to utilize the higher frequency range/band(s) above 24.25 GHz?:  Specify in which band(s) the candidate RIT or candidate SRIT can be deployed.  NOTE 1 – In the case of the candidate SRIT, at least one of the component RITs need to fulfil this requirement.  🗹YES / NO | The supported frequency bands above 24.25 GHz by NR component RIT are provided in item 5.2.3.2.8.3 in characteristics template for SRIT. See the table for frequency range 2 (FR2) for NR component RIT. |

#### D.2.3 Compliance template for technical performance

Detailed results, configurations and specific assumptions can be found in the Annex 2.

D.2.3.1 Compliance template of NR component

The dependent evaluation results are consistency with NR RIT’s.

D.2.3.2 Compliance template of LTE component

| 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? | ChEG’s Comments (3) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Usage scenario | Test environment | Downlink or  uplink |
| **5.2.4.3.1** Peak data rate (Gbit/s) *(4.1)* | eMBB | Not applicable | Downlink | 20 | 24.0~30.1 | Yes | The values are achieved by using 32 carrier aggregation. |
| Uplink | 10 | 12.9 | Yes |
| **5.2.4.3.2** Peak spectral efficiency (bit/s/Hz) *(4.2)* | eMBB | Not applicable | Downlink | 30 | 35.85~47.15 | Yes |  |
| Uplink | 15 | 16.61~20.25 | Yes |
| **5.2.4.3.3** User experienced data rate (Mbit/s) *(4.3)* | eMBB | Dense Urban – eMBB | Downlink | 100 | 100.19~105.43 | Yes | For evaluation configuration A (4 GHz), Channel model A/B. |
| Uplink | 50 | 50.83~65.12 | Yes |
| **5.2.4.3.4** 5th percentile user spectral efficiency (bit/s/Hz) *(4.4)* | eMBB | Indoor Hotspot – eMBB | Downlink | 0.3 | 0.33~0.42 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, with 12 TRxP. |
| Uplink | 0.21 | 0.32~0.54 | Yes |
| eMBB | Dense Urban – eMBB | Downlink | 0.225 | 0.25~0.52 | Yes | For evaluation configuration A (4 GHz), Channel model A/B. |
| Uplink | 0.15 | 0.3~0.41 | Yes |
| eMBB | Rural – eMBB | Downlink | 0.12 | 0.12~0.29 | Yes | For evaluation configuration A (700 MHz), Channel model A/B. |
| Uplink | 0.045 | 0.1~0.22 | Yes |
| Downlink | 0.12 | 0.28~0.46 | Yes | For evaluation configuration B (4 GHz), Channel model A/B. |
| Uplink | 0.045 | 0.07 | Yes |
| **5.2.4.3.5** Average spectral efficiency (bit/s/Hz/ TRxP) *(4.5)* | eMBB | Indoor Hotspot – eMBB | Downlink | 9 | 9.25~11.88 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, with 12 TRxP. |
| Uplink | 6.75 | 7.37~8.84 | Yes |
| eMBB | Dense Urban – eMBB | Downlink | 7.8 | 8.78~14.91 | Yes | For evaluation configuration A (4 GHz), Channel model A/B. |
| Uplink | 5.4 | 6.59~7.68 | Yes |
| eMBB | Rural – eMBB | Downlink | 3.3 | 4.63~11.22 | Yes | For evaluation configuration A (700 MHz), Channel model A/B. |
| Uplink | 1.6 | 3.59~4.30 | Yes |
| Downlink | 3.3 | 9.63~14.75 | Yes | For evaluation configuration B (4 GHz), Channel model A/B.  Not accessed on Uplink results. |
| Uplink | 1.6 | - | - |
| Downlink | 3.3 | 5.96~6.86 | Yes | For evaluation configuration C (LMLC), Channel model A/B. |
| Uplink | 1.6 | 3.31~3.36 | Yes |
| **5.2.4.3.6** Area traffic capacity (Mbit/s/m2) *(4.6)* | eMBB | Indoor-Hotspot – eMBB | Downlink | 10 | 10.20 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, with 12 TRxP. |
| **5.2.4.3.7** User plane latency (ms) *(4.7.1)* | eMBB | Not applicable | Downlink | 4 | 0.73~3.14 | Yes |  |
| Uplink | 4 | 0.73~3.73 | Yes |
| URLLC | Not applicable | Downlink | 1 | 0.63~0.94 | Yes |
| Uplink | 1 | 0.63~0.94 | Yes |
| **5.2.4.3.8** Control plane latency (ms) *(4.7.2)* | eMBB | Not applicable | Not applicable | 20 | 20 | Yes |  |
| URLLC | Not applicable | Not applicable | 20 | 20 | Yes |
| **5.2.4.3.9** Connection density (devices/km2) *(4.8)* | mMTC | Urban Macro – mMTC | Uplink | 1 000 000 | 34,884,000 / 180 kHz ~ 43,692,000 / 180 kHz | Yes | For evaluation configuration A (ISD=500m) with full buffer system level simulation followed by link level simulation; Channel model A/B. |
| Uplink | 1 000 000 | 1,213,000/180 kHz ~ 2,335,000/ 180 kHz | Yes | For evaluation configuration B (ISD=1732m) with full buffer system level simulation followed by link level simulation; Channel model A/B. |
| Uplink | 1 000 000 | 1,225,000 / 180 kHz ~ 16,000,000 / 180 kHz | Yes | For evaluation configuration A (ISD=500m) with non-full buffer system level simulation; Channel model A/B. |
| Uplink | 1 000 000 | 1,018,000/ 2700 kHz~ 1,335,000/ 3240 kHz | Yes | For evaluation configuration B (ISD=1732m) with non-full bffer system level simulation; Channel model A/B. |
| **5.2.4.3.10** Energy efficiency *(4.9)* | eMBB | Not applicable | Not applicable | Capability to support a high sleep ratio and long sleep duration | Sleep ratio: 80%~93.75%  Sleep duration: Up to 39ms | Yes | Network side |
| Sleep ratio: 84.2%~99.1%  Sleep duration:  2.54s~8.62s | Yes | Device side |
| **5.2.4.3.11** Reliability *(4.10)* | URLLC | Urban Macro –URLLC | Downlink | 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 | - | - | Not assessed |
| Uplink | - | - | Not assessed |
| **5.2.4.3.12** Mobility classes *(4.11)* | eMBB | Indoor Hotspot – eMBB | Uplink | Stationary, Pedestrian | - | - | Not assessed |
| eMBB | Dense Urban – eMBB | Uplink | Stationary, Pedestrian,  Vehicular (up to 30 km/h) | Stationary, Pedestrian,  Vehicular (up to 30 km/h) | Yes | For evaluation configuration A (4 GHz) |
| eMBB | Rural – eMBB | Uplink | Pedestrian, Vehicular, High speed vehicular | Pedestrian, Vehicular, High speed vehicular | Yes | For evaluation configuration A (700 MHz) |
| **5.2.4.3.13**  Mobility Traffic channel link data rates (bit/s/Hz) *(4.11)* | eMBB | Indoor Hotspot – eMBB | Uplink | 1.5 (10 km/h) | - | - | Not assessed |
| eMBB | Dense Urban – eMBB | Uplink | 1.12 (30 km/h) | 1.70~1.99 | Yes | For evaluation configuration A (4 GHz), Channel model A/B, LOS and NLOS. |
| eMBB | Rural – eMBB | Uplink | 0.8 (120 km/h) | 1.0~2.79 | Yes | For evaluation configuration A (700 MHz), Channel model A/B, LOS and NLOS. |
| 0.45 (500 km/h) | 0.6~2.59 | Yes |
| **5.2.4.3.14** Mobility interruption time (ms)  *(4.12)* | eMBB and URLLC | Not applicable | Not applicable | 0 | 0 | Yes |  |
| **5.2.4.3.15** Bandwidth and Scalability *(4.13)* | Not applicable | Not applicable | Not applicable | At least 100 MHz | 640 MHz | Yes | Higher frequencies e.g. above 24 GHz are not applicable |
| Up to 1 GHz | N/A |
| Support of multiple different bandwidth values(4) | 6 different bandwidth values | Yes |  |
| (1) As defined in Report ITU-R M.2410-0.  (2) According to the evaluation methodology specified in Report ITU-R M.2412-0.  (3) Proponents should report their selected evaluation methodology of the Connection density, the channel model variant used, and evaluation configuration(s) with their exact values (e.g. antenna element number, bandwidth, etc.) per test environment, and could provide other relevant information as well. For details, refer to Report ITU-R M.2412-0, in particular, § 7.1.3 for the evaluation methodologies, § 8.4 for the evaluation configurations per each test environment, and Annex 1 on the channel model variants.  (4) Refer to § 7.3.1 of Report ITU-R M.2412-0. | | | | | | | |

## Questions and feedback to WP 5D and/or the proponents or other IEGs

ChEG had participated [Workshop on IMT-2020 terrestrial radio interfaces](https://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/imt-2020/Pages/ws-20171004.aspx) in Munich (2017) and 3GPP workshop (2018) hold by ITU-R WP5D and proponent, separately.

Moreover, ChEG is going to discuss with other proponents and IEGs in Workshop on IMT-2020 Terrestrial Radio Interfaces Evaluation (2019) hold by ITU-R WP5D.

Currently, there is no further question.

## Next steps towards to WP 5D for the February 2020 meeting.

ChEG provided final evaluation report in this WP 5D meeting. ChEG has no plan to provide additional evaluation results into the next WP 5D meeting, unless necessary clarification or editorial updates if needed. And ChEG will exchange evaluation related information with proponents and other IEGs during this period.

# 4 Conclusion

According to methods specified in ITU-R documents, ChEG completed evaluations on the submissions in Docs. IMT-2020/13, 14, 15, 16 (i.e. “3GPP technology”) and provides assessment and evaluation results.

ChEG identifies that for the evaluated submissions in Docs. IMT-2020/13, 14, 15, 16

– 3GPP SRIT meets the minimum requirements in all five required test environments.

– 3GPP NR RIT meets the minimum requirements in all five required test environments.

– China ‘NR+NB-IoT’ RIT meets the minimum requirements in all five required test environments.

– Korea ‘NR’ RIT meets the minimum requirements in all five required test environments.

# Annex 1: Calibration information

These calibration results can be found in the attachment “ChEG Calibration results.zip”. It is notable that evaluation configurations of each test environment refer to Report ITU-R M.2412 and received liaison statement from 3GPP.The comparison between ChEG and 3GPP’s calibration can be found in Table A1, in which it is observed that the calibration results from all members are well aligned. The difference of fifth percentage point of CDF in DL geometry (wideband SINR) results between ChEG and 3GPP are typically within 0.01~0.29 dB; while the difference of Coupling Loss is less 0.53 dB.

Table A1

Conclusion on ChEG calibration results

| Test Environment | Evaluation Configuration | Channel model | | Number of samples | 50% CDF on Difference between 3GPP and ChEG | |
| --- | --- | --- | --- | --- | --- | --- |
| Coupling Loss | DL geometry |
| Indoor Hotspot-eMBB | Config A (4GHz) | Channel model A | 12 TRxP | 6 | <0.09 dB | <0.04 dB |
| 36 TRxP | 6 | <0 dB | <0.06 dB |
| Channel model B | 12 TRxP | 6 | <0.15 dB | <0.21 dB |
| 36 TRxP | 7 | <0.09 dB | <0.02 dB |
| Config B (30GHz) | Channel model A/B | 12 TRxP | 6 | <0.04 dB | <0.11 dB |
| 36 TRxP | 6 | <0.05 dB | <0.26 dB |
| Config C (70GHz) | Channel model A/B | 12 TRxP | 6 | <0.17 dB | <0.19 dB |
| 36 TRxP | 5 | <0.13 dB | <0.02 dB |
| Dense Urban-eMBB | Config A (4GHz) | Channel model A | | 7 | <0.53 dB | <0.01 dB |
| Channel model B | | 7 | <0.19 dB | <0.15 dB |
| Config B (30GHz) | Channel model A/B | | 7 | <0.17 dB | <0.57 dB |
| Rural-eMBB | Config A (1732m, 700MHz) | Channel model A | | 7 | <0.2 dB | <0.13 dB |
| Channel model B | | 7 | <0.28 dB | <0.04 dB |
| Config B (1732m, 4GHz) | Channel model A | | 7 | <0.45 dB | <0.26 dB |
| Channel model B | | 7 | <0.37 dB | <0.11 dB |
| Config C (LMLC, 6km, 700MHz) | Channel model A | | 6 | <0.16 dB | <0.13 dB |
| Channel model B | | 6 | <0.04 dB | <0.22 dB |
| Urban Macro-mMTC | Config A (500m, 700MHz) | Channel model A | | 6 | <0.35 dB | <0.22 dB |
| Channel model B | | 6 | <0.37 dB | <0.06 dB |
| Config B (1732m, 700MHz) | Channel model A | | 6 | <0.39 dB | <0.29 dB |
| Channel model B | | 6 | <0.11 dB | <0.11 dB |
| Urban Macro-URLLC | Config A (4GHz) | Channel model A | | 6 | <0.12 dB | <0.18 dB |
| Channel model B | | 6 | <0.22 dB | <0.14 dB |
| Config B (700MHz) | Channel model A | | 6 | <0.45 dB | <0.16 dB |
| Channel model B | | 6 | <0.1 dB | 0.2 dB |

Calibration configurations and results are shown in *ChEG Calibration results.zip*



# Annex 2: Final evaluation report from ChEG

Annex 2-1: Final evaluation results on 3GPP NR

*ChEG-Final evaluation results on 3GPP NR.docx*

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**Annex 2-2: Final evaluation results on 3GPP LTE**

*ChEG-Final evaluation results on 3GPP LTE.docx*



# Annex 3: Detailed simulation results



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1. Submitted on behalf of the Chinese Evaluation Group (ChEG). [↑](#footnote-ref-1)