**3GPP TSG-RAN WG5 Meeting #94-e R5-221066**

**Electronic Meeting, February 21 – March 4, 2022**

**Title:** LS on lower humidity limit in normal temperature test environment

**Response to:**

**Release:** Release 15

**Work Item:** 5GS\_NR\_LTE-UEConTest

**Source:** TSG RAN WG5

**To:** TSG RAN WG4

**Cc:** N/A

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**Attachments:**

**1. Overall Description:**

In RAN5#94-e meeting, the issue of lower humidity limit in normal temperature test environment was discussed in [1]. During the discussion, it is noted that there are inconsistencies on the lower humidity limit in the normal temperature test environment among 2G/3G/4G/5G specifications. The following examples list the excerption from some specifications for temperature conditions.

----------- *excerpt from TS 36.101 v17.4.0* ***(With lower limit)*** -----------

## E.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table E.2.1-1

|  |  |
| --- | --- |
| +15C to +35C | for normal conditions (with relative humidity of 25 % to 75 %) |
| -10C to +55C | for extreme conditions (see IEC publications 68‑2‑1 and 68‑2‑2) |

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation.

----------- *excerpt from TS 38.101-1 v17.4.0* ***(With lower limit)*** -----------

## E.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table E.2.1-1: Temperature conditions

|  |  |
| --- | --- |
| +15C to +35C | For normal conditions (with relative humidity of 25 % to 75 %) |
| -10C to +55C | For extreme conditions (see IEC publications 68‑2‑1 and 68‑2‑2) |

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation.

----------- *excerpt from TS 38.101-2 v17.4.0* ***(With lower limit)*** -----------

## E.2.1 Temperature

All RF requirements for UEs operating in FR2 are defined over the air and can only be tested in an OTA chamber.

The UE shall fulfil all the requirements in the temperature range for extreme conditions, as defined in Table E.2.1-1, unless explicitly stated otherwise in any requirement.

Table E.2.1-1: Temperature conditions

|  |  |
| --- | --- |
| + 25 ⁰C ± 10 ⁰C  | For normal (room temperature) conditions with relative humidity of 25 % to 75 % |
| -10C to +55C | For extreme conditions |

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation.

---------------------- *end of excerption* ***(With lower limit)*** -----------------------

----------- *excerpt from TS 51.010-1 v13.12.0* ***(Without lower limit)*** -----------

## A1.2.2 Normal test conditions (TC2.1)

The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges:

- Temperature: +15°C to +35°C (degrees Celsius).

- Relative humidity: up to 75 %.

NOTE: When it is impracticable to carry out the tests under the conditions stated above, the actual temperature and relative humidity during the tests shall be recorded in the test report.

----------- *excerpt from TS 36.508 v16.7.0* ***(Without lower limit)*** -----------

## 4.1.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table 4.1.1-1: Temperature Test Environment

|  |  |
| --- | --- |
| +15°C to +35°C | for normal conditions (with relative humidity up to 75 %) |
| -10°C to +55°C | for extreme conditions (see IEC publications 68-2-1 and 68-2-2) |

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in TS 36.101 [27] for extreme operation.

The normative reference for this requirement is TS 36.101 [27] Annex E.1.

Some tests are performed also in extreme temperature conditions. These test conditions are denoted as TL (temperature low, -10°C) and TH (temperature high, +55°C).

----------- *excerpt from ETSI EN 301 908-13 v13.2.0* ***(Without lower limit)*** -----------

## B.1.2 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table B.1.2-1: Temperature Test Environment

|  |  |
| --- | --- |
| +15°C to +35°C | For normal conditions (with relative humidity up to 75 %) |
| -10°C to +55°C | For extreme conditions (see IEC 60068-2-1 [4] and IEC 60068-2-2 [5]) |

The normative reference for this requirement is ETSI TS 136 101 [3], clause E.1.

Some tests are performed also in extreme temperature conditions. These test conditions are denoted as TL (Temperature

Low, -10 °C) and TH (Temperature High, +55 °C).

---------------------- *end of excerption* ***(Without lower limit)*** -----------------------

To track the issue on lower limit for humidity for normal test condition, we found that the issue had already been discussed in 3GPP meetings long time ago for GSM/WCDMA/LTE specs. At that time, there had already reached an agreement that no performance dependency on the lower limit for the humidity level is needed in 3GPP specs.

The reason for removing the lower humidity limit in normal conditions for 2G/3G should be also applicable to LTE, NR systems, since it is expected E-UTRA, NR requirements will be tested in same or equivalent test rooms as GSM and WCDMA systems are used. It should also be made sure all systems can be used in same normal conditions.

In addition, ETSI ERM/MSG TFES group agreed to remove the lower limit requirement from the EU harmonized standard EN 301 908-13, release 5, for E-UTRA UE requirements.

So for testing purpose, it doesn’t make any sense to keep the lower limit for the humidity level. To avoid having to declare a lower limit value in UE test, the lower value has been removed in GERAN, UTRAN and E-UTRAN test spec [3-5].

In RAN5#94-e meeting, a CR to LTE test spec and a CR to NR test spec were deferred in [6-7]. During the online discussion, it is commented that RAN5 is tasked to align the temperature test environment with the core spec in RAN4. Considering the inconsistency among the specifications, RAN5 would like to know the exact reason why the test condition for humidity in E-UTRA/NR specifications are different. RAN5 will further consider how to unify the normal test condition for humidity in E-UTRA/NR test specifications based on RAN4 decision in core spec.

**2. Actions:**

**To RAN4 group.**

**ACTION:**

1. RAN WG5 respectfully requests RAN WG4 to provide the reason why the lower humidity limit in normal temperature test environment differs in GERAN/UTRAN/E-UTRAN/NR. Are there any detail considerations to keep the lower humidity limit for normal test environment?

**3. Date of Next TSG-RAN WG5 Meetings:**

TSG-RAN5 Meeting#95-e 16th – 27th May 2022 Electronic Meeting

TSG-RAN5 Meeting#96 22nd – 26th August 2022 Toulouse, FR

References

1. R5-221066, Discussion on the lower humidity limit in temperature test environment, ZTE Corporation, Samsung R&D Institute UK
2. ETSI EN 301 908-13 v13.2.0, IMT cellular networks; Harmonised Standard for access to radio spectrum; Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)
3. GP-080557, Removal of lower limit for humidity in Annex A1.2, TS 51.010-1, Nokia
4. R5-106417, Removal of lower limit for humidity in normal conditions, TS 34.121-1, Nokia
5. R5-110534, Removal of lower humidity limit in normal conditions, TS 36.508, Nokia
6. R5-220853, Correction of 4.1.1 on lower humidity limit in temperature test environment, TS 36.508, Samsung R&D Institute UK, ZTE
7. R5-220778, Correction of 4.1.1 on removal of lower humidity limit in NR test environment, TS 38.508-1, Samsung R&D Institute UK, ZTE
8. R5-211127, Minor corrections of 4.1 for test environment conditions, TS 36.508, ZTE