**3GPP TSG-RAN WG4 Meeting # 107 R4-2309015**

Incheon, KR, May 22 – May 26, 2023

**Agenda Item:** 8.18.3

**Source:** Xiaomi

**Title:** On UE EMC

**Document for:** Approval

# Introduction

During the RAN4#106-bis-e meeting discussion, the UE EMC has been fully discussed and a WF [1] has been agreed. During the WF discussion, the detail test simplification has been explained and in this paper, we try to give further discussion on this issue.

# Discussion

Based on WF [1], we try to focus on the exact spec change for test configuration simplification. The corresponding proposals captured in the WF is listed as below:

Proposal 3: To differentiate the EMC requirements into 3 parts for further test configuration simplification as:

1 Radiated emission test

2 Conducted emission test, radiated immunity test and ESD test

3 Conducted immunity test such as Fast transients common mode, RF common mode, surge and voltage dips.

**Agreement:** FFS together with the implementation work in spec.

Proposal 4: To not touch the requirement or test configuration simplification for the radiated emission test.

Proposal: if Huawei agrees with the proposal please state an agreement so we can include this in the WF and close the discussion.

**Agreement:** Focus on test case reduction and no change on existing UE EMC requirement.

Proposal 5: To select limited number of CA and EN-DC combinations for conducted emission test, radiated immunity test and ESD test.

Proposal: provide the answer to the question on how to select those CA /DC combos, what is the metric for selection?

What does “limited” means in this context? Is it much less than currently considered?

State the opinion on a tentative agreement to go forward with a “limited/reduced number”, while the criteria and metrics remain FFS.

**Agreement:** FFS together with the implementation work in spec.

Proposal 6: To select only one CA and EN-DC combinations for conducted immunity test such as Fast transients common mode, RF common mode, surge and voltage dips.

Proposal: Provide feedback on how to select the specific CA and EN-DC combinations, what is the metric for selection? Have a tentative agreement to go forward with “only one CA and EN-DC combinations”, while the criteria and metrics for selection remain FFS.

**Agreement:** FFS together with the implementation work in spec.

For the proposal 3 as listed above, we try to differentiate the UE EMC requirements into 3 different parts and apply different test configuration to such tests. To be more precise, we captured the UE EMC test in TS 38.124 listed as below:

Table 1 EMC requirement and analysis

|  |  |  |
| --- | --- | --- |
| Sub-clause | Test | Proposed test simplification |
| Emission |
| 8.2 | Radiated emission | No test simplification apply. |
| 8.3 | Conducted emission DC power input/output port | Focus on the DC power supply, can be simplified. |
| 8.4 | Conducted emissions, AC mains power input/output port | Focus on the AC power supply, can be simplified. |
| 8.5 | Harmonic current emissions (AC mains input port) | Focus on the AC power supply, can be simplified. |
| 8.6 | Voltage fluctuations and flicker (AC mains input port) | Focus on the AC power supply, can be simplified. |
| Immunity |
| 9.2 | RF electromagnetic field (80 MHz to 6000 MHz) | No test simplification apply. |
| 9.3 | Electrostatic discharge | No test simplification apply. |
| 9.4 | Fast transients common mode | Focus on the power supply, can be simplified. |
| 9.5 | RF common mode (0.15 MHz to 80 MHz) | Focus on the power supply, can be simplified. |
| 9.6 | Transients and surges, vehicular environment | Focus on the power supply, can be simplified. |
| 9.7 | Voltage dips and interruptions | Focus on the power supply, can be simplified. |
| 9.8 | Surges, common and differential mode | Focus on the power supply, can be simplified. |

Based on the table 1 above, we try to analyse the UE EMC requirement one by one to see the test simplification applicability to each test. As discussed in the RAN4#106-bis-e meeting, the radiated emission test will fully follow the RF test configuration and hence no test simplification apply.

**Proposal 1: No test simplification apply to Radiated emission test.**

For other emission tests, such as Conducted emission DC power input/output port, Conducted emissions, AC mains power input/output port, Harmonic current emissions (AC mains input port), Voltage fluctuations and flicker (AC mains input port), these 4 tests are mainly focus on the DC and AC power supply of the UE. The main purpose is to test the power supply emissions to the electricity network. In this case, we see the RF configuration should have less impact on the test result. In this case, it is propose to simplify the test configuration of these tests.

From CA and DC perspective, it is proposed to have one CA combination and one DC combination that the UE supports as example combinations.

**Proposal 2: For other emission test besides radiated emission, such as Conducted emission DC power input/output port, Conducted emissions, AC mains power input/output port, Harmonic current emissions (AC mains input port), Voltage fluctuations and flicker (AC mains input port), it is proposed to have one CA combination and one DC combination that the UE supports as example combinations.**

For the immunity test, the RF electromagnetic field (80 MHz to 6000 MHz) which also can be called as radiated immunity test, this test tries to see the UE tolerance of a 3V/m electric field. From the test perspective, this test is a little similar to the out-of-band blocking test which also apply an interference signal for a large frequency range. In this case, it is suggested that no test configuration simplification apply to the radiated immunity test. Similarly, to the ESD test, this test is try to see the tolerance of UE when electrostatic discharge appear considering the corresponding electric and magnetic field caused by such discharge.

**Proposal 3: It is proposed that no test simplification apply to the radiated immunity and ESD test.**

Lastly, the rest of the immunity test including Fast transients common mode, RF common mode (0.15 MHz to 80 MHz), Transients and surges, vehicular environment, Voltage dips and interruptions, Surges, common and differential mode, these 5 tests all focus on the power supply and hence it is proposed to have one CA combination and one DC combination that the UE supports as example combinations.

**Proposal 4: For Fast transients common mode, RF common mode (0.15 MHz to 80 MHz), Transients and surges, vehicular environment, Voltage dips and interruptions, Surges, common and differential mode, these 5 tests all focus on the power supply and hence it is proposed to have one CA combination and one DC combination that the UE supports as example combinations.**

With that, we have analysed all the UE EMC requirements and 3 of them are proposed with no test simplification while the rest of them are proposed with one CA combination and one DC combination that the UE supports. On how to select such CA and DC combination, since the combination shall have no impact on such tests, it is proposed to select two bands for CA and DC. One band from below 1GHz as low band and one band from {n41, n77, n78, n79} which is the typical 5G NR band and believe such combination can stand for a typical use scenario for UE.

**Proposal 5: To select one band from below 1GHz as low band and one band from {n41, n77, n78, n79} which is the typical 5G NR band for one CA and one DC combination.**

If the proposed combinations are not supported by UE, it is suggested that UE declare a test band combination for such case.

**Proposal 6: If the proposed combinations are not supported by UE, it is proposed that UE declare a test band combination for such case.**

# 3 Conclusions

In this contribution, we give further discussion on the testing enhancement of UE EMC enhancement and the observation and proposals are shown as below:

**Proposal 1: No test simplification apply to Radiated emission test.**

**Proposal 2: For other emission test besides radiated emission, such as Conducted emission DC power input/output port, Conducted emissions, AC mains power input/output port, Harmonic current emissions (AC mains input port), Voltage fluctuations and flicker (AC mains input port), it is proposed to have one CA combination and one DC combination that the UE supports as example combinations.**

**Proposal 3: It is proposed that no test simplification apply to the radiated immunity and ESD test.**

**Proposal 4: For Fast transients common mode, RF common mode (0.15 MHz to 80 MHz), Transients and surges, vehicular environment, Voltage dips and interruptions, Surges, common and differential mode, these 5 tests all focus on the power supply and hence it is proposed to have one CA combination and one DC combination that the UE supports as example combinations.**

**Proposal 5: To select one band from below 1GHz as low band and one band from {n41, n77, n78, n79} which is the typical 5G NR band for one CA and one DC combination.**

**Proposal 6: If the proposed combinations are not supported by UE, it is proposed that UE declare a test band combination for such case.**

# 4 References

[1] R4-2305913 WF on UE EMC, Xiaomi