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Date: January 31, 2013  
Model No.: WNI20NC0301  
FCC ID.: E2XWNI20NC0301  
IC ID.: 3269B-WNI20NC0301

**FCC Test Report**  
**in accordance with**  
**FCC Part 15 Subpart C Section 15.215 & 15.225**  
**for**  
**NFC Module**

**Samsung Electro-Mechanics Co., Ltd.**

**150, Maeyoung-ro (Maetan-dong), Yeongtong-gu, Suwon-si,  
Gyeonggi-do, 442-743, KOREA**

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**Summary of Test Results:**

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 15 Subpart C Section 15.215 & 15.225 and RSS-210 & RSS-Gen


| No | Reference Clause No.              | FCC Part15 Subpart C Conformance Requirements                                      | Verdict  | Remark |
|----|-----------------------------------|--|----------|--------|
| 1  | 15.215(c)<br>RSS-210 A8.2(a)      | 20 dB Bandwidth & 99 % Bandwidth   | Complied |        |
| 2  | 15.225(a),(b),(c)<br>RSS-210 A2.6 | The field strength of any emission within the band 13.110-14.010 MHz               | Complied |        |
| 3  | 15.225(d)<br>RSS-210 A2.6         | The field strength of any emission appearing outside of the 13.110-14.010 MHz band | Complied |        |
| 4  | 15.225(e)<br>RSS-210 A2.6         | The frequency tolerance of the carrier signal                                      | Complied |        |
| 5  | 15.209(a)<br>RSS-Gen 7.2.5        | Transmitter radiated spurious emissions  | Complied |        |
| 6  | 15.109(a)<br>RSS-Gen 6.1          | Receiver radiated spurious emissions   | Complied |        |
| 7  | 15.207(a)<br>RSS-Gen 7.2.4        | Transmitter AC power line conducted emission                                       | Complied |        |
| 8  | 15.107(a)<br>RSS-Gen 7.2.4        | Receiver AC power line conducted emission  | Complied |        |

**Conclusion:**

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.



Tested by  
Kyung Duk Ko, WiSE Project Engineer  
UL Verification Services- 3014ASEO  
UL Korea Ltd.  
January 31, 2013



Reviewed by  
Jeawoon, Choi, WiSE Engineering Leader  
UL Verification Services- 3014ASEO  
UL Korea Ltd.  
January 31, 2013

## **Test Report Details**

Witnessed By: UL Korea Ltd.  
33<sup>rd</sup> FL. GFC Center, 737 Yeoksam-dong, Gangnam-gu, Seoul, 135-984, Korea

Test Site: EMC Compliance Ltd.  
480-5 Sin-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, 443-390, Korea  
The test facility was deemed to have the environment and capabilities necessary to perform the tests included in the test package.

Applicant: Samsung Electro-Mechanics Co., Ltd.  
314, Maetan 3-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea 443-743

Applicant Contact: Myunglim Ryu  
Title: Senior Engineer  
Phone: 82-31-210-5047  
E-mail: aprilryu@samsung.com

Product Type: NFC Module  
Model Number: WNI20NC0301  
Trademark: SAMSUNG  
Sample Serial Number: N/A

Test standards: FCC Part 15 Subpart C Section 15.215  
Additional provisions to the general radiated emission limitations  
FCC Part 15 Subpart C Section 15.225  
Operation within the band 13.110–14.010 MHz.

RSS-Gen Issue 3  
General Requirements and Information for the Certification of Radio Apparatus  
RSS-210 Issue 8  
Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

Sample Receive Date: December 05, 2012  
Testing Start Date: January 24, 2013  
Date Testing Complete: January 31, 2013

**Overall Results: Pass**

UL Korea Ltd. reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

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## 1. General Product Information

### 1.1. Equipment Description

WNI20NC0301 is the module that integrates NFC (13.56 MHz). This embedded module is optimized for NFC enabled Portable device.

### 1.2. Details of Test Equipment (EUT)

- Equipment Type : NFC Module
- Model No. : WNI20NC0301
- Trade name : SAMSUNG
- Type of test Equipment : module type
- Operating characteristic : Operation within the band 13.110–14.010 MHz.
- Manufacturer : Samsung Electro-Mechanics Co., Ltd.  
150, Maeyoung-ro (Maetan-dong), Yeongtong-gu, Suwon-si, Gyeonggi-do, 442-743,  
KOREA

### 1.3. Equipment Configuration

The EUT is consisted of the following component provided by the manufacturer.

| Use* | Product Type | Manufacturer                        | Model       | Comments |
|------|--------------|-------------------------------------|-------------|----------|
| EUT  | NFC Module   | Samsung Electro-Mechanics Co., Ltd. | WNI20NC0301 | -        |

**Note:** Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)

#### 1.4. Technical Data

| Item                       | Type of NFC Module              |
|----------------------------|---------------------------------|
| Operating Frequency Ranges | 13.56 MHz                       |
| Emission Designator        | A1D                             |
| Kind of modulation (s)     | ASK                             |
| Antenna information        | Integral antenna (Loop Antenna) |
| Receiver class             | Receiver class 3                |
| Duty cycle class           | Class 2                         |
| Working temperature        | -20 ~ 85 °C                     |
| Supply Voltage             | DC 3.8 V                        |

Note ;

1. All the technical data described above were provided by the manufacturer.

#### 1.5. Antenna Information

Antenna Model Name : WPR14NRC4010  
 Antenna Type : Loop Antenna  
 Manufacturer : Samsung Electro-Mechanics Co., Ltd.

#### 1.6. Equipment Type :

- Radio and ancillary equipment for fixed or semi-fixed use  
 Radio and ancillary equipment for vehicular mounted use  
 Radio and ancillary equipment for portable or handheld use
- Stand alone     Host connected     Host connected
- Self contained single unit     Module with associated connection or interface

#### 1.7. Technical descriptions and documents

The following documents was provided by the manufacturer.

| No. | Document Title and Description  |
|-----|---|
| 1   | User Manual   |
| 2   | Technical Document for supporting SONY_HK (WNI20NC0301) / Samsung Electro-Mechanics Co., Ltd. |

#### 1.8. Description of additional model name

| Model name  | Model name Designation | Description of design |
|-------------|------------------------|-----------------------|
| WNI20NC0301 | Basic model            | -                     |

## 2. Test Specification

The following test specifications and standards have been applied and used for testing.

- 1) FCC Part 15 Subpart C Section 15.215 Additional provisions to the general radiated emission limitations
- 2) FCC Part 15 Subpart C Section 15.225 Operation within the band 13.110–14.010 MHz
- 3) ANSI C63.4:2009 : American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
- 4) ANSI C63.10:2009 : American National Standard for Testing Unlicensed Wireless Devices

### 3. Test Conditions

#### 3.1. Equipment Used During Test

| Use* | Product Type | Manufacturer                        | Model         | Comments |
|------|--------------|-------------------------------------|---------------|----------|
| EUT  | NFC Module   | Samsung Electro-Mechanics Co., Ltd. | WNI20NC0301   | -        |
| AE   | Note PC      | TOSHIBA                             | PSLQ0K-02N005 | -        |

**Note:** Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)

#### 3.2. Input/Output Ports

| No | Port Name     | Type* | Cable Max. >3m (Y/N) | Cable Shielded (Y/N) | Comments                     |
|----|---------------|-------|----------------------|----------------------|------------------------------|
| 1  | Power Input   | DC    | N                    | N                    | Connected to DC Power supply |
| 2  | Radio Antenna | I/O   | N                    | Y                    | -                            |

Note:  
 \*AC = AC Power Port      DC = DC Power Port      N/E = Non-Electrical  
 I/O = Signal Input or Output Port (Not Involved in Process Control)  
 TP = Telecommunication Ports

#### 3.3. Power Interface

| Mode # | Voltage (V)                           | Current (A)                 | Power (W) | Frequency (DC/AC-Hz) | Phases (#) | Comments                  |
|--------|---------------------------------------|-----------------------------|-----------|----------------------|------------|---------------------------|
| Rated  | 3.8 Vdc                               | -                           | -         | DC                   | -          | Normal operating voltage  |
| Rated  | Input : 100~250 Vac<br>Output : 5 Vdc | Input : 0.5<br>Output : 0.8 | -         | 50/60 Hz             |            | Rated of AC to DC Adapter |
| 1      | 3.8 Vdc                               | -                           | -         | DC                   | -          | V <sub>Nom</sub>          |
| 2      | 120 Vac                               | -                           | -         | 60 Hz                | -          | Normal operating voltage  |
| 3      | 3.42 Vdc                              | -                           | -         | DC                   | -          | V <sub>Min</sub>          |
| 4      | 4.18 Vdc                              | -                           | -         | DC                   | -          | V <sub>Max</sub>          |



### 3.4. Operating Frequencies

| Mode # | Frequency tested                      |
|--------|---------------------------------------|
| 1      | Operating frequency range : 13.56 MHz |

### 3.5. Operation Modes

| Mode # | Description  |
|--------|--|
| 1      | Carrier on mode with modulation : Signal from the RF module was generated continuously by the test program incorporated    |
| 2      | Carrier on mode with un-modulation : Signal from the RF module was generated continuously by the test program incorporated |
| 3      | Carrier off mode   |

### 3.6. Environment Conditions

| Parameters     | Normal condition                |
|----------------|---------------------------------|
| Temperature    | + 15°C ~ +35°C                  |
| Humidity       | 20% ~ 75%                       |
| Supply voltage | 3.8 Vdc (Rated nominal voltage) |

Note ;

- The extreme condition is applied to the boundary limits of the declared operational environmental condition by the manufacturer.
- The operating condition for humidity requirement has not been declared in the manufacturer's specification.
- Test has been carried out for three frequencies specified above under the normal condition and for the extreme condition, minimum and maximum frequencies has been tested.

### 3.7. Test Configurations

| Mode # | Description   |
|--------|---|
| 1      | <p>Shield room enclosure</p> <p>LISN</p> <p>AC/DC Adaptor</p> <p>EUT</p> <p>Table height 0.8m</p> <p>0.4m</p> <p>to Test Receiver</p> <p>Power Line</p> |
| 2      | <p>AC/DC Adaptor</p> <p>EUT</p> <p>Test Receiver</p> <p>Power Line</p>  |
| 3      | <p>DC Power Supply</p> <p>EUT</p> <p>Attenuator</p> <p>Spectrum Analyzer</p>  |

### 3.8. List of Test Equipment

|                                     | Description             | Manufacturer | Model     | Identifier | Next Cal Date. |
|-------------------------------------|-------------------------|--------------|-----------|------------|----------------|
| <input checked="" type="checkbox"/> | Temp & humidity chamber | taekwang     | TK-04     | TK001      | 13.12.07       |
| <input type="checkbox"/>            | Temp & humidity chamber | taekwang     | TK-500    | TK002      | 13.09.05       |
| <input type="checkbox"/>            | Frequency Counter       | HP           | 53150A    | US39250565 | 13.09.04       |
| <input checked="" type="checkbox"/> | Spectrum Analyzer       | Agilent      | E4440A    | MY46186407 | 14.01.20       |
| <input checked="" type="checkbox"/> | Spectrum Analyzer       | R & S        | FSP40     | 100209     | 13.10.23       |
| <input checked="" type="checkbox"/> | Signal Generator        | R & S        | SMR40     | 100007     | 13.06.27       |
| <input type="checkbox"/>            | Modulation Analyzer     | HP           | 8901B     | 3538A05527 | 13.11.06       |
| <input type="checkbox"/>            | Audio Analyzer          | HP           | 8903B     | 3729A19213 | 14.01.07       |
| <input type="checkbox"/>            | AC Power Supply         | KIKUSUI      | PCR2000W  | GB001619   | 13.10.23       |
| <input type="checkbox"/>            | DC Power Supply         | Tektronix    | PS2520G   | TW50517    | 13.02.06       |
| <input checked="" type="checkbox"/> | DC Power Supply         | Tektronix    | PS2521G   | TW53135    | 13.10.23       |
| <input type="checkbox"/>            | Dummy Load              | BIRD         | 8141      | 7560       | 13.09.09       |
| <input type="checkbox"/>            | Dummy Load              | BIRD         | 8401-025  | 799        | 13.09.09       |
| <input checked="" type="checkbox"/> | EMI Test Receiver       | R&S          | ESCI      | 100001     | 13.07.10       |
| <input type="checkbox"/>            | Attenuator              | HP           | 8494A     | 2631A09825 | 13.10.24       |
| <input type="checkbox"/>            | Attenuator              | HP           | 8496A     | 3308A16640 | 13.10.24       |
| <input type="checkbox"/>            | Attenuator              | R & S        | RBS1000   | D67079     | 13.10.24       |
| <input type="checkbox"/>            | Power sensor            | R & S        | NRP-Z81   | 100677     | 13.05.04       |
| <input checked="" type="checkbox"/> | LOOP Antenna            | EMCO         | EMCO6502  | 9205-2745  | 13.05.23       |
| <input checked="" type="checkbox"/> | BILOG Antenna           | Schwarzbeck  | VULB 9168 | 375        | 13.09.21       |
| <input type="checkbox"/>            | HORN Antenna            | ETS          | 3115      | 00062589   | 13.09.06       |
| <input type="checkbox"/>            | HORN Antenna            | ETS          | 3116      | 00086632   | 13.11.15       |
| <input type="checkbox"/>            | Power Divider           | Weinschel    | 1580-1    | NX375      | 13.10.23       |
| <input type="checkbox"/>            | Power Divider           | Weinschel    | 1580-1    | NX380      | 13.09.09       |
| <input type="checkbox"/>            | Power Divider           | Weinschel    | 1594      | 671        | 13.09.10       |
| <input checked="" type="checkbox"/> | Test Receiver           | R&S          | ESHS30    | 828765/009 | 13.08.06       |
| <input checked="" type="checkbox"/> | LISN                    | R&S          | ENV216    | 101358     | 14.01.07       |
| <input checked="" type="checkbox"/> | LISN                    | PMM          | L2-16A    | 0000J10705 | -              |

#### 4. Overview of Technical requirements

| The following essential requirements and test specifications are relevant to the presumption of conformity FCC Part 15 Subpart C Section 15.215 & 15.225 RSS-210 & RSS-Gen |  |                  | Reported |
|--|--|------------------|----------|
| Reference Clause No.   | Essential technical requirements   | Test method      |          |
| 15.215(c)<br>RSS-210 A8.2(a)   | 20 dB Bandwidth & 99 % Bandwidth   | ANSI C63.10-2009 | [ X ]    |
| 15.225(a),(b),(c)<br>RSS-210 A2.6  | The field strength of any emission within the band 13.110-14.010 MHz               | ANSI C63.10-2009 | [ X ]    |
| 15.225(d)<br>RSS-210 A2.6  | The field strength of any emission appearing outside of the 13.110-14.010 MHz band | ANSI C63.10-2009 | [ X ]    |
| 15.225(e)<br>RSS-210 A2.6  | The frequency tolerance of the carrier signal                                      | ANSI C63.10-2009 | [ X ]    |
| 15.209(a)<br>RSS-Gen 7.2.5   | Transmitter radiated spurious emissions  | ANSI C63.4-2009  | [ X ]    |
| 15.109(a)<br>RSS-Gen 6.1   | Receiver radiated spurious emissions   | ANSI C63.4-2009  | [ X ]    |
| 15.207(a)<br>RSS-Gen 7.2.4   | Transmitter AC power line conducted emission                                       | ANSI C63.4-2009  | [ X ]    |
| 15.107(a)<br>RSS-Gen 7.2.4   | Receiver AC power line conducted emission  | ANSI C63.4-2009  | [ X ]    |

## 5. Test Results

### 5.1. 20 dB Bandwidth & 99 % Bandwidth

| TEST: 20 dB Bandwidth & 99 % Bandwidth                             |  |                   |
|--|--|-------------------|
| Method   | <p>The transmitter output is connected to the Spectrum analyzer. 20 dB Bandwidth from the EUT was measured under the below setting condition.</p> <ol style="list-style-type: none"> <li>1. Set resolution bandwidth (RBW) = 1-5 % of the emission bandwidth (EBW).</li> <li>2. Set the video bandwidth (VBW) <math>\geq 3 \times</math> RBW.</li> <li>3. Detector = Peak.</li> <li>4. Trace mode = max hold.</li> <li>5. Sweep = auto couple.</li> <li>7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is 1-5 %.</li> </ol> |                   |
| Reference Clause   | Part15 Subpart C Section 15.215 (c)<br>RSS-210 A8.2(a)   |                   |
| Parameters recorded during the test                                | Laboratory Ambient Temperature   | 22 °C             |
|  | Relative Humidity  | 36 %              |
|  | Frequency range  | Measurement Point |
| Fully configured sample scanned over the following frequency range | 13.56 MHz  | Antenna port      |

### Configuration Settings

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 1   | 1   | 3   |
| Supplementary information: None             |   |   |

### Limits

According to §15.215 (c), Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of band operation.

5.1.1. Measurement Results

Table 1. Data Table of 20 dB Bandwidth

| Environmental condition |       | Measured Frequency (MHz) | Lower Frequency (MHz) | Upper Frequency (MHz) | 20 dB Bandwidth (kHz) | 99 % Bandwidth (kHz) |      |
|-------------------------|-------|--------------------------|-----------------------|-----------------------|-----------------------|----------------------|------|
| T <sub>Nom.</sub>       | 22 °C | V <sub>NOM</sub> 3.8 Vdc | 13.55991              | 13.55916              | 13.56066              | 1.47                 | 2.01 |

Figure 1. Plots of 20 dB Bandwidth

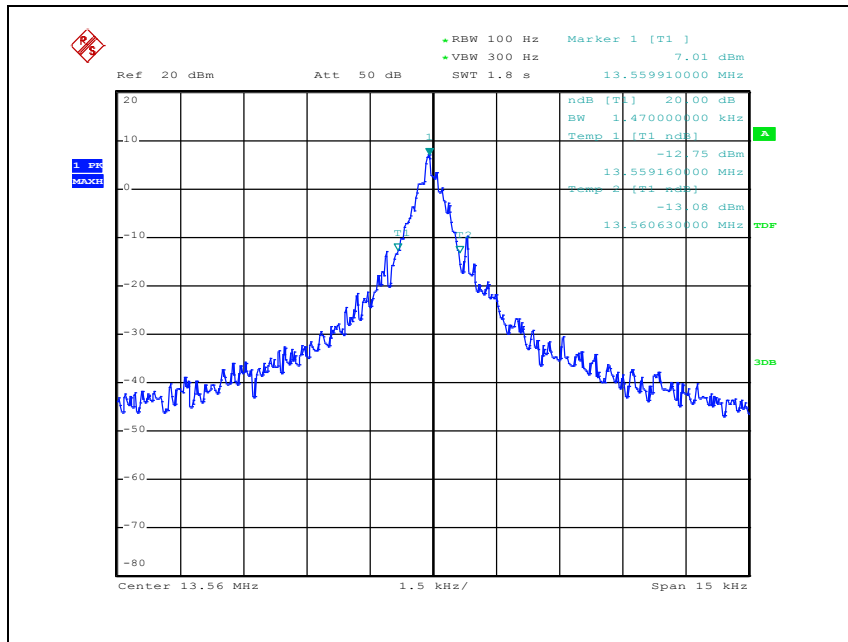
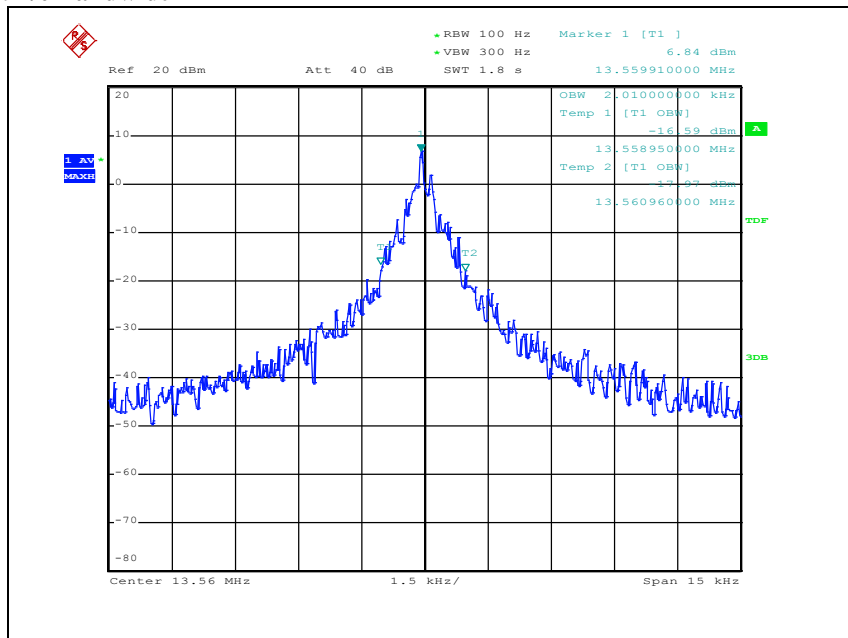


Figure 2. Plots of 99 % Bandwidth



**5.2. The field strength of any emission within the band 13.110-14.010 MHz**

| <b>TEST: The field strength of any emission within the band 13.110-14.010 MHz</b> |  |                    |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
|---|--|--------------------|---------------|---------------|-----------|---------------------|------------|------------------|----------------------|------------|-----------------|------------------------|------------|--------------------|
| Method  | <p>The E-field produced by the equipment shall be measured at standard distance of 10 m. Where this is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m and stated in the test report.</p> <p>The E-field is measured with a shielded loop antenna connected to a measurement receiver. The measuring bandwidth and detector type of the measurement receiver shall be in accordance with the table as below;</p> <table border="1"> <thead> <tr> <th>Frequency (f)</th> <th>Detector type</th> <th>Bandwidth</th> </tr> </thead> <tbody> <tr> <td>9 kHz ≤ f &lt; 150 kHz</td> <td>Quasi Peak</td> <td>200 Hz to 300 Hz</td> </tr> <tr> <td>150 kHz ≤ f &lt; 30 MHz</td> <td>Quasi Peak</td> <td>9 kHz to 10 kHz</td> </tr> <tr> <td>30 MHz ≤ f ≤ 1 000 MHz</td> <td>Quasi Peak</td> <td>100 kHz to 120 kHz</td> </tr> </tbody> </table> |                    | Frequency (f) | Detector type | Bandwidth | 9 kHz ≤ f < 150 kHz | Quasi Peak | 200 Hz to 300 Hz | 150 kHz ≤ f < 30 MHz | Quasi Peak | 9 kHz to 10 kHz | 30 MHz ≤ f ≤ 1 000 MHz | Quasi Peak | 100 kHz to 120 kHz |
| Frequency (f)   | Detector type  | Bandwidth          |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| 9 kHz ≤ f < 150 kHz   | Quasi Peak   | 200 Hz to 300 Hz   |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| 150 kHz ≤ f < 30 MHz  | Quasi Peak   | 9 kHz to 10 kHz    |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| 30 MHz ≤ f ≤ 1 000 MHz  | Quasi Peak   | 100 kHz to 120 kHz |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| Reference Clause  | Part15 Subpart C Section 15.225(a),(b),(c)<br>RSS-210 A2.6   |                    |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| Parameters recorded during the test   | Laboratory Ambient Temperature   | 22 °C              |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
|   | Relative Humidity  | 36 %               |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
|   | Frequency range  | Measurement Point  |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| Fully configured sample scanned over the following frequency range                | 13.110 – 14.010 MHz  | Antenna port       |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |

**Configuration Settings**

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 2   | 1   | 2   |
| Supplementary information: None             |   |   |

**Limits**

According to the Section 15.225,

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

| Frequency range (MHz)                | E-field strength limit (Ef) dBµV/m at 30 m | E-field strength limit (Ef) dBµV/m at 10 m |
|--------------------------------------|--|--|
| 13.553–13.567                        | 84.0                                       | 103.1 (Note)                               |
| 13.410 to 13.553<br>13.567 to 13.710 | 50.5                                       | 69.6 (Note)                                |
| 13.110 to 13.410<br>13.710 to 14.010 | 40.5                                       | 59.6 (Note)                                |

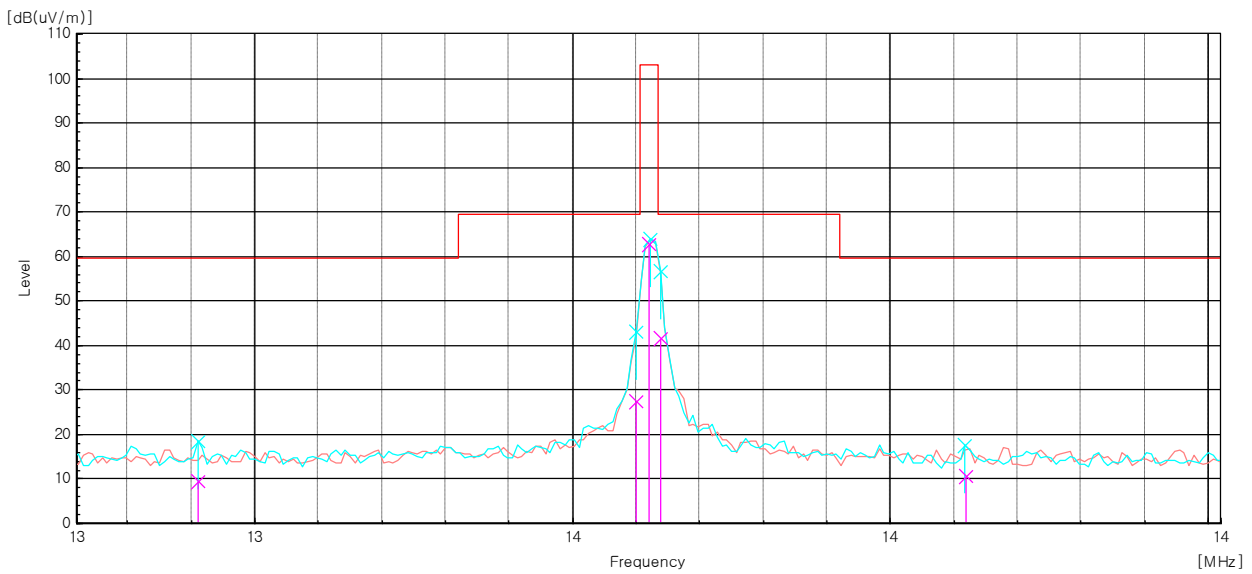
Note : According to section 15.31(f)(2), 40 dB/decade is used for the inverse linear distance below 30 MHz.

Limit at 10 m (dBuV/m) = Limit at 30 m (dBuV/m) + 40 log(30/10) (dB)

**Measurement Results**

**Table 2.** Data Table of within the band 13.110-14.010 MHz

| Radiated emissions    |                 |                |             | Ant  | Correction factors          | Limit (dBuV/m) | Total           |             |
|-----------------------|-----------------|----------------|-------------|------|-----------------------------|----------------|-----------------|-------------|
| Frequency range (MHz) | Frequency (MHz) | Reading (dBuV) | Detect Mode | Pol. | AF (dB/m)+ Amp gain+CL (dB) |                | Actual (dBuV/m) | Margin (dB) |
| 13.110 ~ 13.410       | 13.205          | 31.5           | Q.P.        | V    | -21.9                       | 59.6           | 9.6             | 50.0        |
| 13.410 ~ 13.553       | 13.550          | 49.5           | Q.P.        | V    | -21.9                       | 69.6           | 27.6            | 42.0        |
| 13.553 ~ 13.567       | 13.560          | 84.8           | Q.P.        | V    | -21.9                       | 103.1          | 62.9            | 40.2        |
| 13.567 ~ 13.710       | 13.569          | 63.5           | Q.P.        | V    | -21.9                       | 69.6           | 41.6            | 28.0        |
| 13.710 ~ 14.010       | 13.809          | 32.5           | Q.P.        | V    | -21.9                       | 59.6           | 10.6            | 49.0        |





**5.3. The field strength of any emission appearing outside of the 13.110-14.010 MHz band**

| TEST: The field strength of any emission appearing outside of the 13.110-14.010 MHz band |  |                    |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
|--|--|--------------------|---------------|---------------|-----------|---------------------|------------|------------------|----------------------|------------|-----------------|------------------------|------------|--------------------|
| Method   | <p>The E-field produced by the equipment shall be measured at standard distance of 10 m. Where this is not practical, e.g. due to physical size of the equipment including the antenna or with use of special field cancelling antenna, then other distances may be used. When another distance is used, the distance used and the field strength value measured shall be stated in the test report. In this case, the measured value at actual test distance shall be extrapolated to 10 m and stated in the test report.</p> <p>The E-field is measured with a shielded loop antenna connected to a measurement receiver. The measuring bandwidth and detector type of the measurement receiver shall be in accordance with the table as below;</p> <table border="1"> <thead> <tr> <th>Frequency (f)</th> <th>Detector type</th> <th>Bandwidth</th> </tr> </thead> <tbody> <tr> <td>9 kHz ≤ f &lt; 150 kHz</td> <td>Quasi Peak</td> <td>200 Hz to 300 Hz</td> </tr> <tr> <td>150 kHz ≤ f &lt; 30 MHz</td> <td>Quasi Peak</td> <td>9 kHz to 10 kHz</td> </tr> <tr> <td>30 MHz ≤ f ≤ 1 000 MHz</td> <td>Quasi Peak</td> <td>100 kHz to 120 kHz</td> </tr> </tbody> </table> |                    | Frequency (f) | Detector type | Bandwidth | 9 kHz ≤ f < 150 kHz | Quasi Peak | 200 Hz to 300 Hz | 150 kHz ≤ f < 30 MHz | Quasi Peak | 9 kHz to 10 kHz | 30 MHz ≤ f ≤ 1 000 MHz | Quasi Peak | 100 kHz to 120 kHz |
| Frequency (f)  | Detector type  | Bandwidth          |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| 9 kHz ≤ f < 150 kHz  | Quasi Peak   | 200 Hz to 300 Hz   |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| 150 kHz ≤ f < 30 MHz   | Quasi Peak   | 9 kHz to 10 kHz    |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| 30 MHz ≤ f ≤ 1 000 MHz   | Quasi Peak   | 100 kHz to 120 kHz |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| Reference Clause   | Part15 Subpart C Section 15.225(d)<br>RSS-210 A2.6   |                    |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| Parameters recorded during the test  | Laboratory Ambient Temperature   | 22 °C              |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
|  | Relative Humidity  | 36 %               |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
|  | Frequency range  | Measurement Point  |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |
| Fully configured sample scanned over the following frequency range                       | 9 kHz ~ 30 MHz   | Antenna port       |               |               |           |                     |            |                  |                      |            |                 |                        |            |                    |

**Configuration Settings**

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 2   | 1   | 2   |
| Supplementary information: None             |   |   |

**Limits**

According to the Section 15.225,

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209..

| Frequency range (MHz) | E-field strength limit (Ef) μV/m | E-field strength limit (Ef) dBμV/m at 10 m |
|-----------------------|----------------------------------|--|
| 0.009 to 0.150        | 2400/F(kHz) at 300 m             | 107.6 to 83.2                              |
| 0.150 to 0.490        | 2400/F(kHz) at 300 m             | 83.2 to 72.9                               |
| 0.490 to 1.705        | 24000/F(kHz) at 30 m             | 92.9 to 82.1                               |
| 1.705 to 30           | 30 at 30 m                       | 88.6                                       |

Note : According to section 15.31(f)(2), 40 dB/decade is used for the inverse linear distance below 30 MHz.

Limit at 10 m (dBuV/m) = Limit at 300 m (dBuV/m) + 40 log(300/10) (dB)

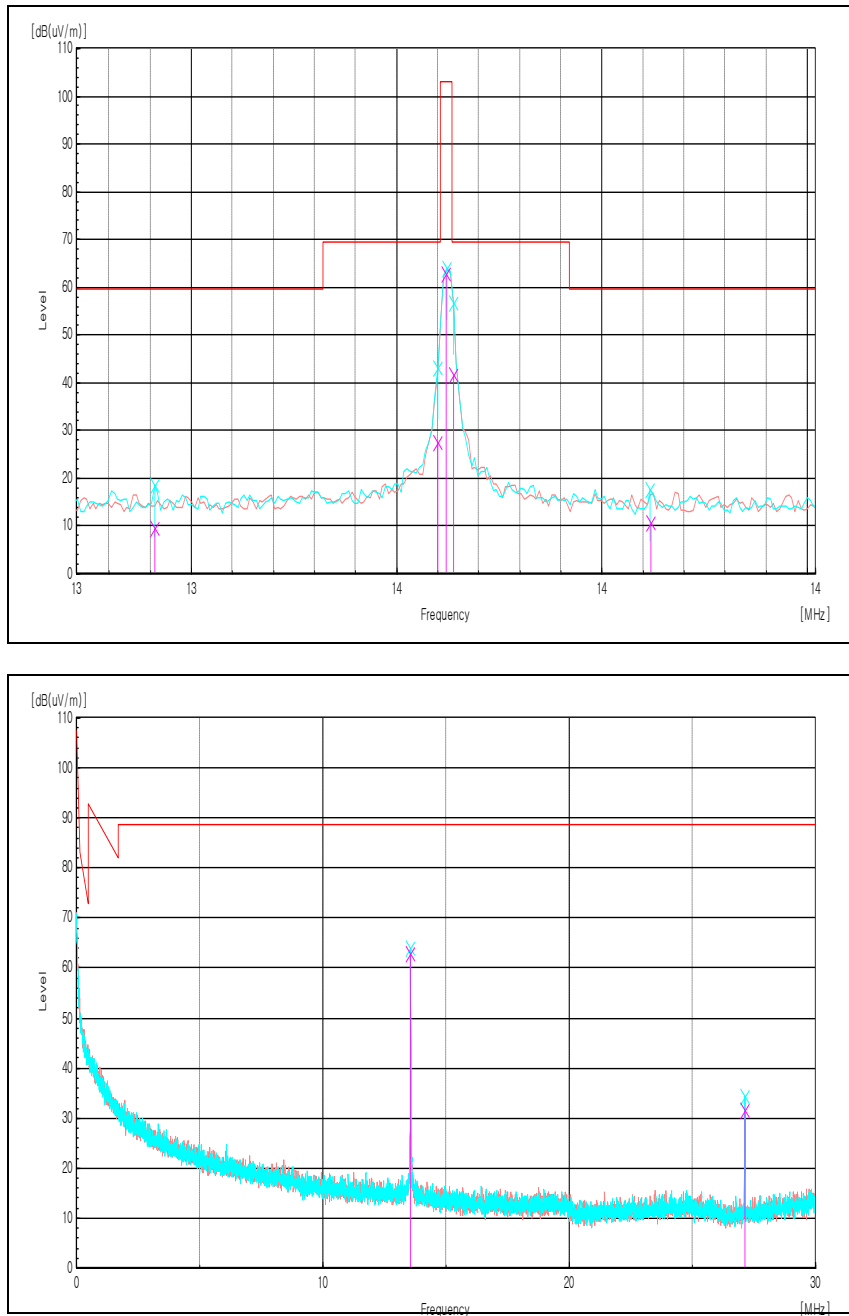
Limit at 10 m (dBuV/m) = Limit at 30 m (dBuV/m) + 40 log(30/10) (dB)

**Measurement Result**

**Table 3.** Data Table of The field strength of any emission appearing outside of the 13.110-14.010 MHz band

| Radiated emissions       |                    |                   |                | Ant  | Correction factors                   | Limit<br>(dBuV/m) | Total              |                |
|--------------------------|--------------------|-------------------|----------------|------|--------------------------------------|-------------------|--------------------|----------------|
| Frequency range<br>(MHz) | Frequency<br>(MHz) | Reading<br>(dBuV) | Detect<br>Mode | Pol. | AF<br>(dB/m)+<br>Amp gain+CL<br>(dB) |                   | Actual<br>(dBuV/m) | Margin<br>(dB) |
| 0.009 ~ 0.150            | -                  | -                 | Q.P.           | -    | -                                    | -                 | -                  | -              |
| 0.150 ~ 0.490            | -                  | -                 | Q.P.           | -    | -                                    | -                 | -                  | -              |
| 0.490 ~ 1.705            | -                  | -                 | Q.P.           | -    | -                                    | -                 | -                  | -              |
| 1.705 ~ 13.110           | 13.560             | 84.8              | Q.P.           | V    | -21.9                                | 88.6              | 62.9               | 25.7           |
| 14.010 ~ 30              | 27.121             | 55.6              | Q.P.           | V    | -23.9                                | 88.6              | 31.7               | 56.9           |

**Figure 3.** The field strength of any emission appearing outside of the 13.110-14.010 MHz band



#### 5.4. The frequency tolerance of the carrier signal

| <b>TEST: The frequency tolerance of the carrier signal</b>         |   |                   |
|--|---|-------------------|
| Method   | 1. The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the CW Microwave Frequency Counter. The test was performed at frequency using all applicable un-modulation.<br>2. The EUT was placed inside the temperature chamber.<br>3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter. |                   |
| Reference Clause   | Part15 Subpart C Section 15.225(e)<br>RSS-210 A2.6  |                   |
| Parameters recorded during the test                                | Laboratory Ambient Temperature  | 22 °C             |
|  | Relative Humidity   | 36 %              |
|  | Frequency range   | Measurement Point |
| Fully configured sample scanned over the following frequency range | 13.56 MHz   | Antenna port      |

#### Configuration Settings

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 1, 3, 4                                     | 2   | 3   |
| Supplementary information: None             |   |   |

#### Limits

According to the Section 15.225(e), The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a. temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

**Measurement Results**

**Table 4. Test Result**

| <b>Frequency Stability versus Temperature</b>  |                      |                                    |                      |        |
|--|----------------------|------------------------------------|----------------------|--------|
| Environment Temperature (°C)                   | Power Supplied (Vdc) | Frequency Measure with Time Elapse |                      |        |
|  |                      | Measured Frequency (MHz)           | Frequency Error (Hz) | %      |
| 50   | 3.8                  | 13.55983                           | 0.0002               | -0.001 |
| 40   |                      | 13.55988                           | 0.0001               | -0.001 |
| 30   |                      | 13.55988                           | 0.0001               | -0.001 |
| 20   |                      | 13.55984                           | 0.0002               | -0.001 |
| 10   |                      | 13.55984                           | 0.0002               | -0.001 |
| 0  |                      | 13.55982                           | 0.0002               | -0.001 |
| -10  |                      | 13.55981                           | 0.0002               | -0.001 |
| -20  |                      | 13.55980                           | 0.0002               | -0.001 |
| <b>Frequency Stability versus power Supply</b> |                      |                                    |                      |        |
| Environment Temperature (°C)                   | Power Supplied (Vdc) | Frequency Measure with Time Elapse |                      |        |
|  |                      | Measured Frequency (MHz)           | Frequency Error (Hz) | %      |
| 24   | 4.3                  | 13.55988                           | 0.0001               | -0.001 |
|  | 3.8                  | 13.55989                           | 0.0001               | -0.001 |
|  | 3.2                  | 13.55985                           | 0.0001               | -0.001 |

Supplementary information:

The percent of the reference frequency (%) = (Measured frequency – Reference frequency) / Reference frequency

### 5.5. Radiated Spurious Emissions Measurement

| TEST: Radiated spurious emissions measurement                      |   |                   |
|--|---|-------------------|
| Method   | Radiated emissions from the EUT were measured according to ANSI C63.4 procedure.<br>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation. The antenna is varied from 1 to 4 meters above the ground to find the maximum field strength. Measurement are made with both horizontal and vertical polarizations For fundamental investigation, the EUT was positioned for 3 orthogonal orientations.<br>2. For measurement below 1GHz, the resolution bandwidth is set to 100 kHz for peak detection or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. |                   |
| Reference Clause   | Part15 Subpart C Section 15.209(a)<br>RSS-Gen 7.2.5   |                   |
| Parameters recorded during the test                                | Laboratory Ambient Temperature  | 22 °C             |
|  | Relative Humidity   | 36 %              |
|  | Frequency range   | Measurement Point |
| Fully configured sample scanned over the following frequency range | 30 MHz – 1 GHz  | 3 meter chamber   |

#### Configuration Settings

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 2   | 1   | 2   |
| Supplementary information: None             |   |   |

#### Limits

According to § 15.209(a), the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Distance (meters) | Field Strength (dBuV/m) | Field Strength (uV/m) |
|-----------------|-------------------|-------------------------|-----------------------|
| 30-88           | 3                 | 40.0                    | 100                   |
| 88-216          | 3                 | 43.5                    | 150                   |
| 216-960         | 3                 | 46.0                    | 200                   |
| Above 960       | 3                 | 54.0                    | 500                   |

## Measurement Results

**Table 5. Test Result**

| Radiated emissions |                |             | Ant  | Correction factors          | Total           | Limit          |             |
|--------------------|----------------|-------------|------|-----------------------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBuV) | Detect Mode | Pol. | AF (dB/m)+ Amp gain+CL (dB) | Actual (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
| 67.800             | 49.2           | QP          | V    | -15.3                       | 33.9            | 40.0           | 6.1         |
| 135.609            | 52.3           | QP          | V    | -14.4                       | 37.9            | 43.5           | 5.6         |
| 149.169            | 46.8           | QP          | H    | -13.7                       | 33.1            | 43.5           | 10.4        |

### **Supplementary information:**

- The frequency spectrum from 30 MHz to 1 000 MHz was investigated. Emission levels of 30 dB below than the limit is not reported.
- The worst case is x-axis and reported.
- Actual = Reading + AF + CL (AF : Antenna factor, CL : Cable loss)
- Distance factor =  $20\log(\text{Measurement distance} / \text{The measured distance})$
- Margin = Limit (dBuV/m) - Actual (dBuV/m)

### 5.6. Receiver radiated spurious emissions

| TEST: Receiver radiated spurious emissions                         |   |                   |
|--|---|-------------------|
| Method   | Radiated emissions from the EUT were measured according to ANSI C63.4 procedure.<br>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation. The antenna is varied from 1 to 4 meters above the ground to find the maximum field strength. Measurement are made with both horizontal and vertical polarizations For fundamental investigation, the EUT was positioned for 3 orthogonal orientations.<br>2. For measurement below 1GHz, the resolution bandwidth is set to 100 kHz for peak detection or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. |                   |
| Reference Clause   | Part15 Subpart B Section 15.109(a)<br>RSS-Gen 6.1   |                   |
| Parameters recorded during the test                                | Laboratory Ambient Temperature  | 22 °C             |
|  | Relative Humidity   | 36 %              |
|  | Frequency range   | Measurement Point |
| Fully configured sample scanned over the following frequency range | 30 MHz – 1 GHz  | 3 meter chamber   |

#### Configuration Settings

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 2   | 3   | 2   |
| Supplementary information: None             |   |   |

#### Limits

According to § 15.109(a), Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency (MHz) | Distance (meters) | Field Strength (dBuV/m) | Field Strength (uV/m) |
|-----------------|-------------------|-------------------------|-----------------------|
| 30-88           | 3                 | 40.0                    | 100                   |
| 88-216          | 3                 | 43.5                    | 150                   |
| 216-960         | 3                 | 46.0                    | 200                   |
| Above 960       | 3                 | 54.0                    | 500                   |



## Measurement Results

**Table 6. Test Result**

| Radiated emissions |                |             | Ant  | Correction factors             | Total           | Limit          |             |
|--------------------|----------------|-------------|------|--------------------------------|-----------------|----------------|-------------|
| Frequency (MHz)    | Reading (dBuV) | Detect Mode | Pol. | AF (dB/m)+<br>Amp gain+CL (dB) | Actual (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
| 804.666            | 21.2           | QP          | V    | -0.8                           | 20.4            | 46.0           | 25.6        |

### **Supplementary information:**

- The frequency spectrum from 30 MHz to 1 000 MHz was investigated. Emission levels of 30 dB below than the limit is not reported.
- The worst case is x-axis and reported.
- Actual = Reading + AF + CL (AF : Antenna factor, CL : Cable loss)
- Distance factor =  $20\log(\text{Measurement distance} / \text{The measured distance})$
- Margin = Limit (dBuV/m) - Actual (dBuV/m)

### 5.7. Transmitter AC Power Line Conducted Emission

| TEST: Transmitter AC Power Line Conducted Emission                 |   |  |
|--|---|--|
| Method   | AC line conducted emissions from the EUT were measured according to the dictates of ANSI C63.4-2003.<br><br>1. The test procedure is performed in a 5.05m × 4.0m × 3.0m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m(W) × 1.5 m(L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.<br>2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.<br>3. The excess power cable between the EUT and the LISN was bundled. All connecting cables of EUT were moved to find the maximum emission. |  |
| Basic Standard   | Part15 Subpart C Section 15.207(a)<br>RSS-Gen 7.2.4   |  |
| Parameters recorded during the test                                | Laboratory Ambient Temperature  | 22°C                                     |
|  | Relative Humidity   | 46%                                      |
| -  | Frequency range on each side of line  | Measurement Point                        |
| Fully configured sample scanned over the following frequency range | 150 kHz to 30 MHz   | A.C. Input port of A.C. to D.C. adapter. |

### Configuration Settings

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 2   | 1   | 1   |
| Supplementary information: None             |   |   |

### Limits

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

| Frequency of Emission (MHz) | Conducted limit (dB µV) |          |
|-----------------------------|-------------------------|----------|
|                             | Quasi-peak              | Average  |
| 0.15 – 0.5                  | 66 - 56*                | 56 - 46* |
| 0.5 – 5                     | 56                      | 46       |
| 5 – 30                      | 60                      | 50       |

\* Decreases with the logarithm of the frequency.

**Measurement Results**

**5.7.1. Test data for conducted emission\_with Antenna**

| Frequency [MHz] | Correction |       | Line | Quasi-peak   |                |               |             | Average      |                |               |             |
|-----------------|------------|-------|------|--------------|----------------|---------------|-------------|--------------|----------------|---------------|-------------|
|                 | Factor     |       |      | Limit [dBuV] | Reading [dBuV] | Result [dBuV] | Margin [dB] | Limit [dBuV] | Reading [dBuV] | Result [dBuV] | Margin [dB] |
|                 | LISN       | Cable |      |              |                |               |             |              |                |               |             |
| 0.189           | 9.85       | 0.04  | H    | 64.08        | 42.47          | 52.36         | 11.72       | 54.08        | 28.93          | 38.82         | 15.26       |
| 0.192           | 9.85       | 0.04  | N    | 63.95        | 44.51          | 54.40         | 9.55        | 53.95        | 32.94          | 42.83         | 11.12       |
| 0.252           | 9.85       | 0.04  | N    | 61.69        | 40.05          | 49.94         | 11.75       | 51.69        | 28.45          | 38.34         | 13.35       |
| 0.255           | 9.85       | 0.04  | H    | 61.59        | 37.24          | 47.13         | 14.46       | 51.59        | 23.87          | 33.76         | 17.83       |
| 0.339           | 9.90       | 0.04  | N    | 59.23        | 33.66          | 43.60         | 15.63       | 49.23        | 17.85          | 27.79         | 21.44       |
| 0.408           | 9.96       | 0.05  | N    | 57.69        | 30.78          | 40.79         | 16.90       | 47.69        | 13.96          | 23.97         | 23.72       |
| 0.504           | 10.01      | 0.05  | H    | 56.00        | 29.11          | 39.17         | 16.83       | 46.00        | 12.16          | 22.22         | 23.78       |
| 1.083           | 9.79       | 0.05  | N    |              | 26.15          | 35.99         | 20.01       |              | 11.74          | 21.58         | 24.42       |
| 2.472           | 9.67       | 0.05  | H    |              | 22.45          | 32.17         | 23.83       |              | 14.33          | 24.05         | 21.95       |
| 27.120          | 9.73       | 0.15  | N    | 60.00        | 39.14          | 49.02         | 10.98       | 50.00        | 38.10          | 47.98         | 2.02        |

<Note>

- Margin(dB) = Limit(dBuV) - Level(dBuV)
- Excluded Frequency : 13.56 MHz

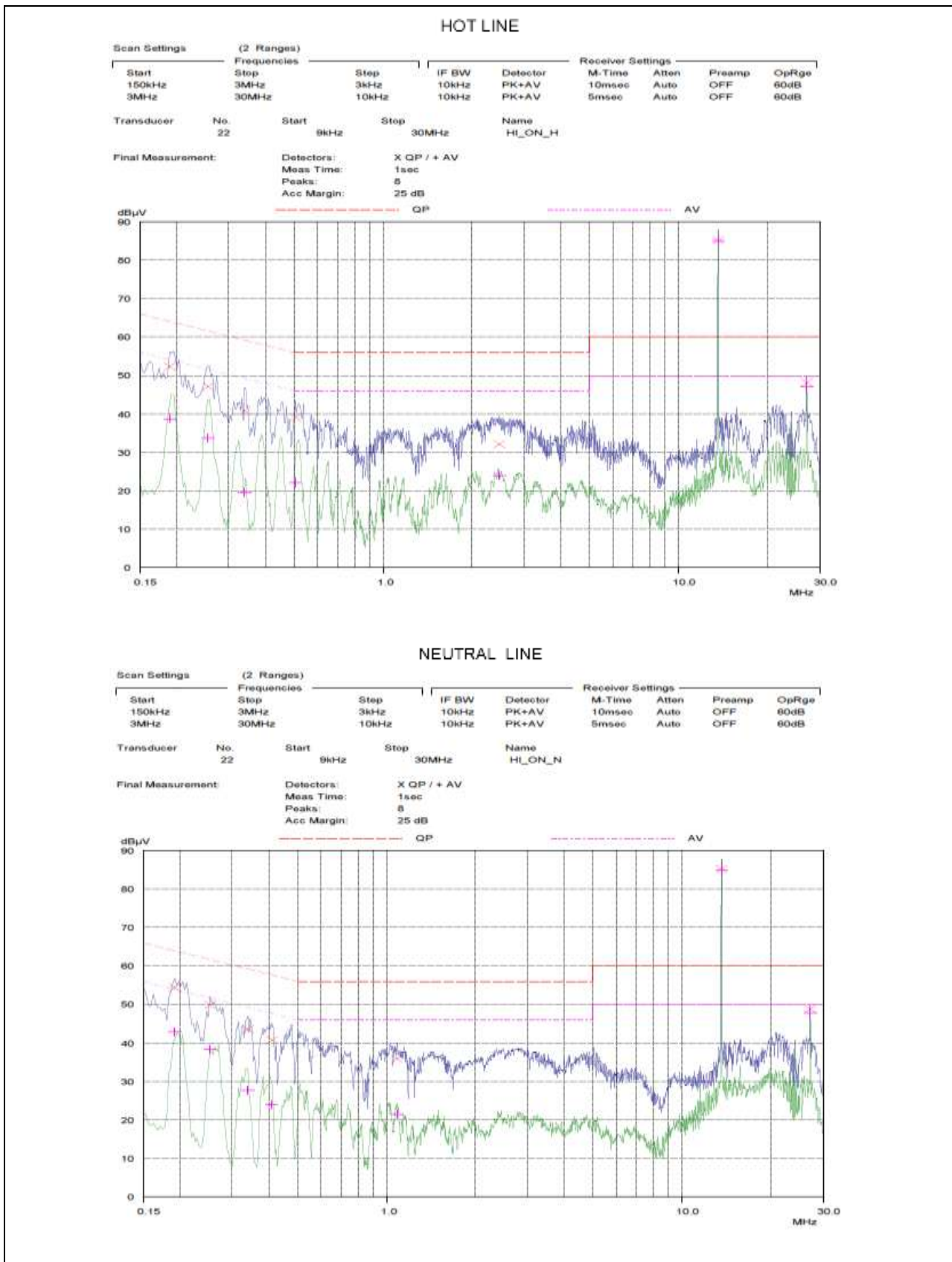
**5.7.2. Test data for conducted emission\_with dummy load**

| Frequency [MHz] | Correction |       | Line | Quasi-peak   |                |               |             | Average      |                |               |             |
|-----------------|------------|-------|------|--------------|----------------|---------------|-------------|--------------|----------------|---------------|-------------|
|                 | Factor     |       |      | Limit [dBuV] | Reading [dBuV] | Result [dBuV] | Margin [dB] | Limit [dBuV] | Reading [dBuV] | Result [dBuV] | Margin [dB] |
|                 | LISN       | Cable |      |              |                |               |             |              |                |               |             |
| 0.189           | 9.90       | 0.07  | N    | 64.08        | 47.97          | 57.94         | 6.14        | 54.08        | 32.64          | 42.61         | 11.47       |
| 0.192           | 9.91       | 0.07  | H    | 63.95        | 50.69          | 60.67         | 3.28        | 53.95        | 35.96          | 45.94         | 8.01        |
| 0.252           | 9.90       | 0.07  | N    | 61.69        | 39.38          | 49.35         | 12.34       | 51.69        | 25.34          | 35.31         | 16.38       |
| 0.258           | 9.91       | 0.07  | H    | 61.50        | 41.21          | 51.19         | 10.31       | 51.50        | 28.74          | 38.72         | 12.78       |
| 0.402           | 10.02      | 0.07  | N    | 57.81        | 32.58          | 42.67         | 15.14       | 47.81        | 18.70          | 28.79         | 19.02       |
| 0.507           | 9.94       | 0.07  | N    | 56.00        | 28.99          | 39.00         | 17.00       | 46.00        | 9.76           | 19.77         | 26.23       |
| 0.618           | 9.94       | 0.07  | N    |              | 24.69          | 34.70         | 21.30       |              | 6.45           | 16.46         | 29.54       |
| 1.023           | 9.96       | 0.07  | H    |              | 24.01          | 34.04         | 21.96       |              | 8.70           | 18.73         | 27.27       |
| 2.685           | 9.95       | 0.10  | N    |              | 25.83          | 35.88         | 20.12       |              | 10.42          | 20.47         | 25.53       |
| 2.757           | 9.96       | 0.10  | H    |              | 23.99          | 34.05         | 21.95       |              | 10.31          | 20.37         | 25.63       |
| 5.390           | 9.98       | 0.11  | N    | 60.00        | 21.97          | 32.06         | 27.94       | 50.00        | 8.55           | 18.64         | 31.36       |
| 7.270           | 10.08      | 0.14  | N    |              | 20.56          | 30.78         | 29.22       |              | 9.24           | 19.46         | 30.54       |
| 13.530          | 10.51      | 0.18  | H    |              | 26.05          | 36.74         | 23.26       |              | 22.90          | 33.59         | 16.41       |
| 13.560          | 10.41      | 0.18  | N    |              | 26.83          | 37.42         | 22.58       |              | 23.20          | 33.79         | 16.21       |

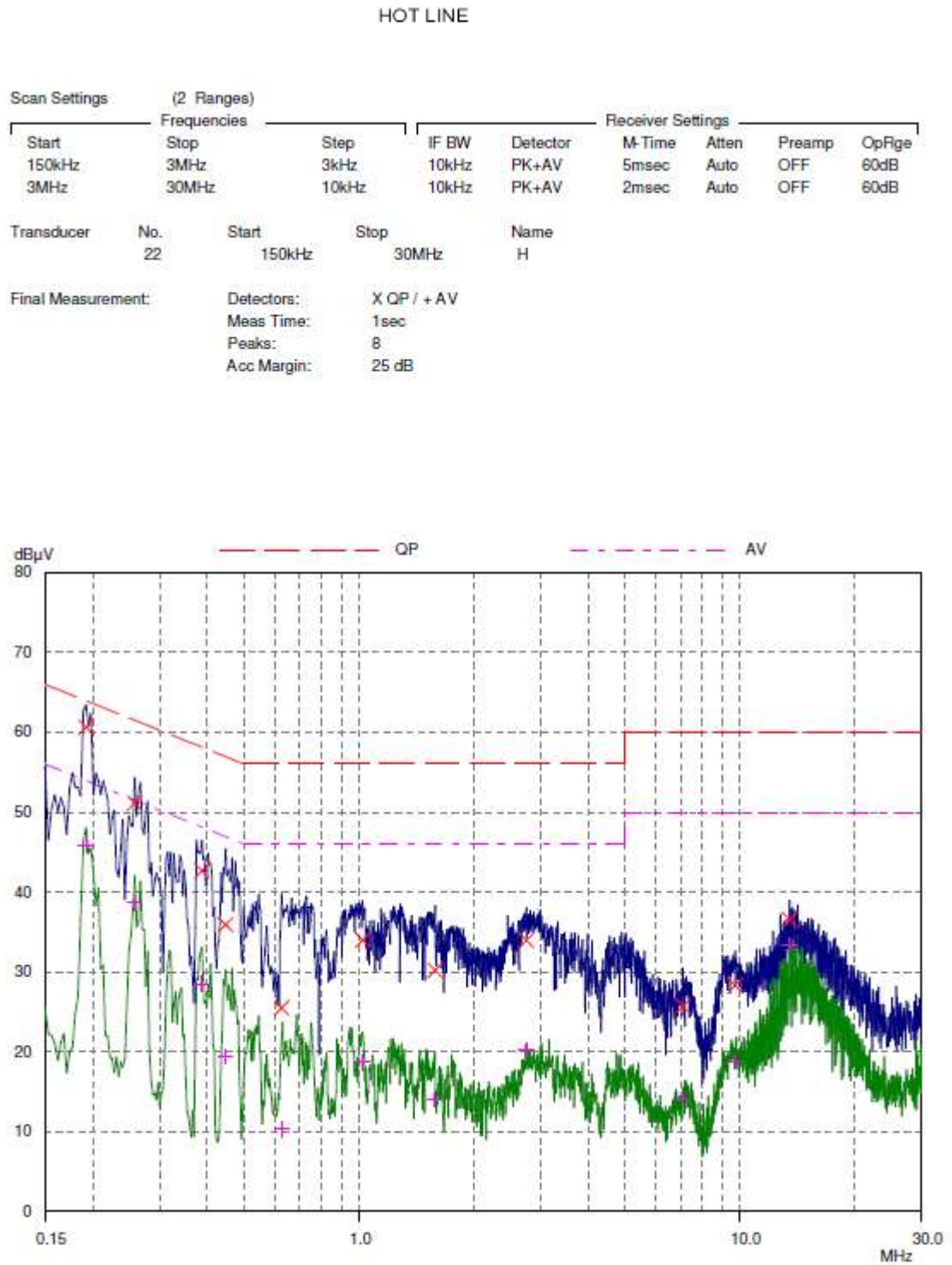
<Note>

- Margin(dB) = Limit(dBuV) - Level(dBuV)

Figure 4. Graphical representation of Conducted Emission\_with Antenna



**Figure 5. Graphical representation of Conducted Emission\_with dummy load**



NEUTRAL LINE

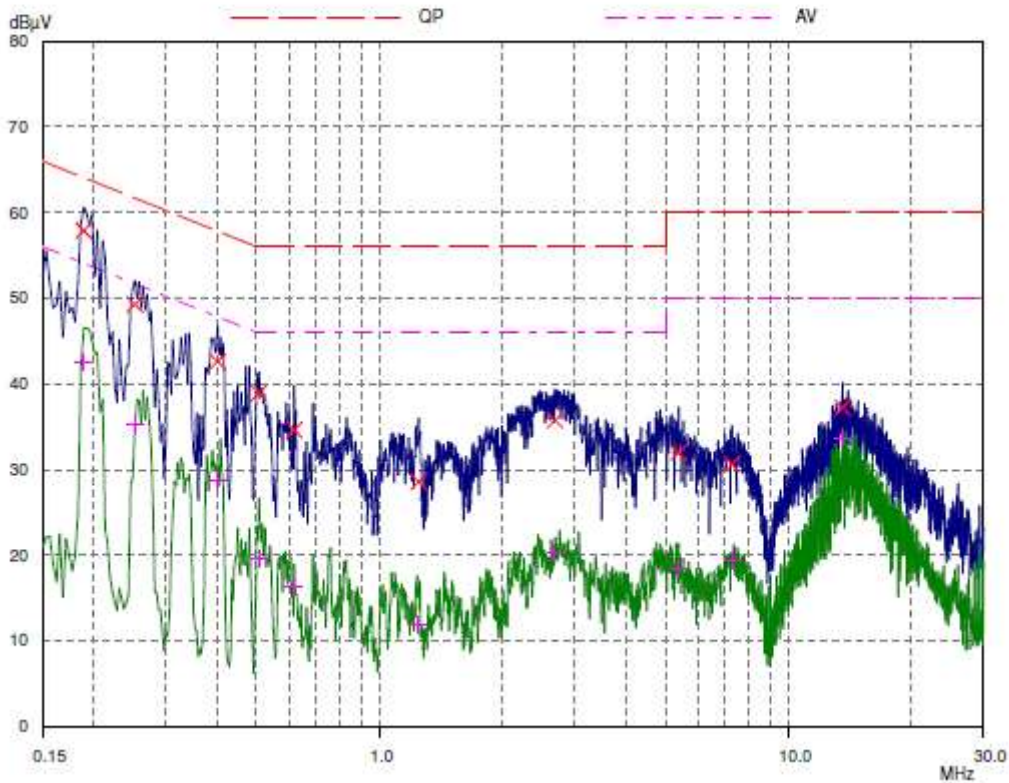
| Scan Settings |       |       | (2 Ranges) |          | Receiver Settings |       |        |       |
|---------------|-------|-------|------------|----------|-------------------|-------|--------|-------|
| Start         | Stop  | Step  | IF BW      | Detector | M-Time            | Atten | Preamp | OpRge |
| 150kHz        | 3MHz  | 3kHz  | 10kHz      | PK+AV    | 5msec             | Auto  | OFF    | 60dB  |
| 3MHz          | 30MHz | 10kHz | 10kHz      | PK+AV    | 2msec             | Auto  | OFF    | 60dB  |

| Transducer | No. | Start  | Stop  | Name |
|------------|-----|--------|-------|------|
|            | 22  | 150kHz | 30MHz | N    |

| Final Measurement: | Detectors:  | X OP / + AV |
|--------------------|-------------|-------------|
|                    | Meas Time:  | 1sec        |
|                    | Peaks:      | 8           |
|                    | Acc Margin: | 25 dB       |



### 5.8. Receiver AC Power Line Conducted Emission

| TEST: Receiver AC Power Line Conducted Emission                    |   |  |
|--|---|--|
| Method   | AC line conducted emissions from the EUT were measured according to the dictates of ANSI C63.4-2003.<br><br>1. The test procedure is performed in a 5.05m × 4.0m × 3.0m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m(W) × 1.5 m(L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.<br>2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.<br>3. The excess power cable between the EUT and the LISN was bundled. All connecting cables of EUT were moved to find the maximum emission. |  |
| Basic Standard   | Part15 Subpart C Section 15.107(a)<br>RSS-Gen 7.2.4   |  |
| Parameters recorded during the test                                | Laboratory Ambient Temperature  | 22°C                                     |
|  | Relative Humidity   | 46%                                      |
| -  | Frequency range on each side of line  | Measurement Point                        |
| Fully configured sample scanned over the following frequency range | 150 kHz to 30 MHz   | A.C. Input port of A.C. to D.C. adapter. |

### Configuration Settings

| Power Interface Mode #<br>(See Section 3.3) | EUT Operation Mode #<br>(See Section 3.5) | Test Configurations Mode #<br>(See Section 3.7) |
|---|---|---|
| 2   | 3   | 1   |
| Supplementary information: None             |   |   |

### Limits

According to §15.107, (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

| Frequency of Emission (MHz) | Conducted limit (dB μV) |          |
|-----------------------------|-------------------------|----------|
|                             | Quasi-peak              | Average  |
| 0.15 – 0.5                  | 66 - 56*                | 56 - 46* |
| 0.5 – 5                     | 56                      | 46       |
| 5 – 30                      | 60                      | 50       |

\* Decreases with the logarithm of the frequency.

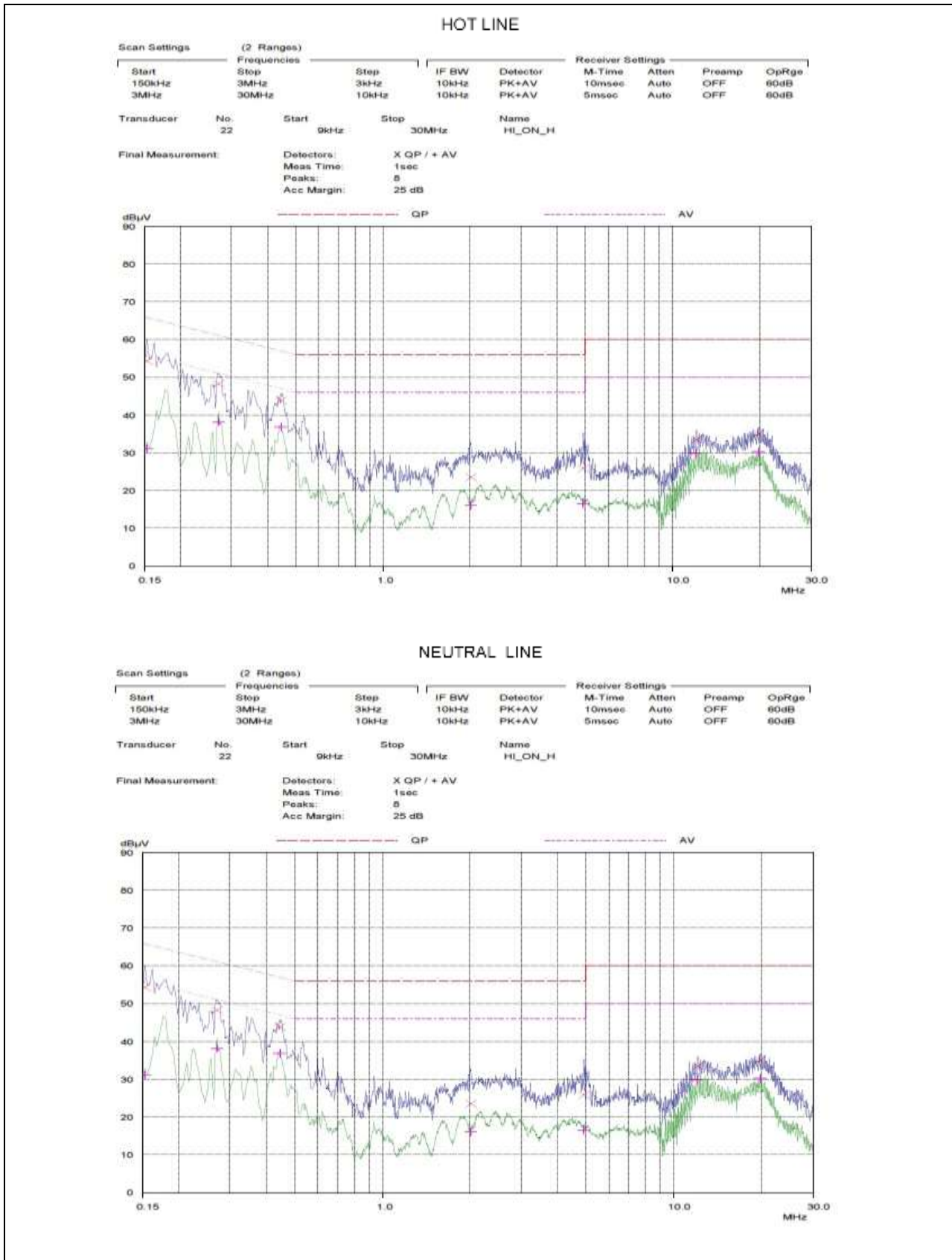
**Measurement Results**

**5.8.1. Test data for conducted emission**

| Frequency<br>[MHz] | Correction<br>Factor |       | Line | Quasi-peak |         |        |        | Average |         |        |        |
|--------------------|----------------------|-------|------|------------|---------|--------|--------|---------|---------|--------|--------|
|                    | LISN                 | Cable |      | Limit      | Reading | Result | Margin | Limit   | Reading | Result | Margin |
|                    |                      |       |      | [dBuV]     | [dBuV]  | [dBuV] | [dB]   | [dBuV]  | [dBuV]  | [dBuV] | [dB]   |
| 0.153              | 9.83                 | 0.03  | N    | 65.84      | 44.44   | 54.30  | 11.54  | 55.84   | 21.17   | 31.03  | 24.81  |
| 0.264              | 9.85                 | 0.04  | H    | 61.30      | 38.88   | 48.77  | 12.53  | 51.30   | 16.29   | 26.18  | 25.12  |
| 0.270              | 9.85                 | 0.04  | N    | 61.12      | 38.40   | 48.29  | 12.83  | 51.12   | 28.36   | 38.25  | 12.87  |
| 0.444              | 9.96                 | 0.05  | N    | 56.99      | 33.86   | 43.87  | 13.12  | 46.99   | 26.94   | 36.95  | 10.04  |
| 0.491              | 10.01                | 0.05  | H    | 56.00      | 14.17   | 24.23  | 31.77  | 46.00   | 7.76    | 17.82  | 28.18  |
| 1.194              | 9.79                 | 0.05  | N    |            | 16.06   | 25.90  | 30.10  | 46.00   | 6.81    | 16.65  | 29.35  |
| 18.840             | 9.66                 | 0.14  | H    | 60.00      | 25.81   | 35.61  | 24.39  | 50.00   | 18.72   | 28.52  | 21.48  |
| 19.730             | 9.74                 | 0.14  | N    |            | 25.38   | 35.26  | 24.74  | 50.00   | 20.46   | 30.34  | 19.66  |



Figure 6. Graphical representation of Conducted Emission



### APPENDIX A. Accreditations and Authorizations

EMC Compliance Ltd. has been accredited / filed / authorized by the agencies listed in the following table;

| Certificate   | Nation | Agency | Code                      | Mark                          |
|---------------|--------|--------|---------------------------|-------------------------------|
| Accreditation | Korea  | KOLAS  | No. 231                   | ISO/IEC 17025                 |
| Site Filing   | USA    | FCC    | 508785                    | Test Facility list & NSA Data |
|               | Japan  | VCCI   | C-1713<br>R-1606<br>T-258 | Test Facility list & NSA Data |
| Certification | Korea  | KC     | KR0040                    | Test Facility list & NSA Data |

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competent of calibration and testing laboratory”.