

## VARIANT EMC TEST REPORT

|            |   |
|------------|---|
| Applicant: | HMD Global Oy                               |
| Address:   | Bertel Jungin aukio 9, 02600 Espoo, Finland |

|                           |  |
|---------------------------|--|
| Manufacturer or Supplier: | HMD Global Oy                                      |
| Address:                  | Bertel Jungin aukio 9, 02600 Espoo, Finland        |
| Product:                  | Multi-band GSM/WCDMA/LTE phone with Bluetooth&WLAN |
| Brand Name:               | Nokia  |
| Model Name:               | TA-1444  |
| FCC ID:                   | 2AJOTTA-1444                                       |
| Date of tests:            | Jan. 02, 2022 ~ Jan. 24, 2022                      |

The submitted sample of the above equipment has been tested for according to the requirements of the following standards:

- FCC Part 15, Subpart B, Class A  
 FCC Part 15, Subpart B, Class B  
 ANSI C63.4:2014

**CONCLUSION: The submitted sample was found to COMPLY with the test requirement**

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*Simon*

*Luke Lu*

Date: Feb. 23, 2022

Date: Feb. 23, 2022

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## RELEASE CONTROL RECORD

| ISSUE NO.         | REASON FOR CHANGE  | DATE ISSUED   |
|-------------------|--|---------------|
| W7L-P21120037EM01 | Original release   | Jan. 24, 2022 |
| W7L-P21120038EM01 | The model name is revised based on the W7L-P21120037EM01 report. The two models are only the difference between single SIM and double SIM, and the data reflects the original report data. | Feb. 23, 2022 |



# 1 GENERAL INFORMATION

## 1.1 GENERAL DESCRIPTION OF EUT

|  |  |  |
|--|--|--|
| <b>PRODUCT</b>   | Multi-band GSM/WCDMA/LTE phone with Bluetooth&WLAN             |  |
| <b>BRAND NAME</b>  | Nokia  |  |
| <b>MODEL NAME</b>  | TA-1444  |  |
| <b>NOMINAL VOLTAGE</b>                                     | 5.0Vdc(adapter or host equipment)<br>3.85Vdc (Li-ion, battery) |  |
| <b>MODULATION TYPE</b>                                     | <b>BT_LE</b>   | GFSK   |
|  | <b>Bluetooth</b>   | GFSK, $\pi/4$ -DQPSK, 8DPSK  |
|  | <b>FM</b>  | FM   |
|  | <b>WLAN</b>  | DSSS, OFDM   |
|  | <b>GNSS</b>  | BPSK   |
|  | <b>GSM/GPRS/EDGE</b>   | GMSK, 8PSK   |
|  | <b>WCDMA</b>   | QPSK   |
|  | <b>LTE</b>   | QPSK/16QAM/64QAM   |
| <b>OPERATING<br/>FREQUENCY<br/>OPERATING<br/>FREQUENCY</b> | <b>Bluetooth/BT_LE</b>   | 2402MHz ~ 2480MHz  |
|  | <b>FM</b>  | 87.5MHz ~ 108MHz   |
|  | <b>WLAN</b>  | 2412 ~ 2462MHz for 11b/g/n(HT20)   |
|  | <b>GPS/BDS/<br/>GLONASS</b>                                    | 1559MHz ~ 1610MHz  |
|  | <b>GSM</b>   | 824.2MHz ~ 848.8MHz (FOR GSM 850)<br>1850.2MHz ~ 1909.8MHz (FOR GSM 1900)  |
|  | <b>WCDMA</b>   | 1852.4MHz ~ 1907.6MHz(FOR WCDMA Band 2)<br>1712.4MHz ~ 1752.6MHz(FOR WCDMA Band 4)<br>826.4MHz ~ 846.6MHz (FOR WCDMA Band 5)   |
|  | <b>LTE</b>   | 1850.7MHz ~ 1909.3MHz (FOR LTE Band2)<br>1710.7MHz ~ 1754.3MHz (FOR LTE Band4)<br>824.7MHz ~ 848.3MHz (FOR LTE Band5)<br>2502.5MHz ~ 2567.5MHz (FOR LTE Band7)<br>699.7MHz ~ 715.3MHz (FOR LTE Band12)<br>779.5MHz ~ 784.5MHz (FOR LTE Band13)<br>706.5MHz ~ 713.5MHz (FOR LTE Band17)<br>1710.7MHz ~ 1779.3MHz (FOR LTE Band66) |
| <b>HW VERSION</b>  | 19661_1_12   |  |



|                          |   |
|--------------------------|---|
| <b>SW VERSION</b>        | 000T_0_050  |
| <b>I/O PORTS</b>         | Refer to user's manual  |
| <b>CABLE SUPPLIED</b>    | USB cable: unshielded without ferrite, 1.0meter<br>Earphone1: non-shielded cable, with w/o ferrite core, 1.2 meter<br>Earphone2: non-shielded cable, with w/o ferrite core, 1.2 meter |
| <b>ACCESSORY DEVICES</b> | Refer to note as below  |

**NOTE:**

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

**List of Accessory:**

| <b>ACCESSORIES</b> | <b>BRAND</b> | <b>MANUFACTURER</b>                              | <b>MODEL</b> | <b>SPECIFICATION</b>                         |
|--------------------|--------------|--|--------------|--|
| Battery            | Nokia        | GUANGDONG FENGHUA NEW ENERGY CO.,LTD.            | WT410        | Capacity: 3.85 Vdc, 3920mAh                  |
| AC Adapter         | Nokia        | ShenZhenBaiJunDa Electronic CO., LTD.            | AD-010U      | I/P: 100-240Vac, 0.35A,<br>O/P: 5.0Vdc, 2.0A |
| Earphone 1         | Nokia        | NEW LEADER INDUSTRY CO.,LTD                      | HS-34        | Signal Line, 1.2meter                        |
| Earphone 2         | Nokia        | Guangdong Wivtak Technology Co., Ltd.            | HS-34        | Signal Line, 1.2meter                        |
| USB Cable          | Nokia        | Saibao(Jiangxi) Communication Industrial Co.,Ltd | CB-12A       | Signal Line, 1.0meter                        |

## 1.2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 15, Subpart B              |                                       |            |
|---|---------------------------------------|------------|
| Standard Section                                      | Test Item                             | Result     |
| FCC Part 15,<br>Subpart B, Class B<br>ANSI C63.4:2014 | Conducted Test                        | Compliance |
|   | Radiated Emission Test (30MHz ~ 1GHz) | Compliance |
|   | Radiated Emission Test (Above 1GHz)   | Compliance |

## 1.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| MEASUREMENT         | FREQUENCY      | UNCERTAINTY |
|---------------------|----------------|-------------|
| Conducted emissions | 150kHz ~ 30MHz | ±2.70dB     |
| Radiated emissions  | 30MHz~1GMHz    | ±4.98dB     |
|                     | 1GMHz ~6GMHz   | ±4.70dB     |
|                     | 6GMHz ~18GMHz  | ±4.60dB     |



### 1.4 DESCRIPTION OF TEST MODES

| Test Mode                     | Test Condition  |
|-------------------------------|---|
| <b>Radiated emission test</b> |   |
| 1                             | GSM850 Idle + Adapter1 + SIM1 + USB cable 1 + BT Idle + WIFI Idle + Front Camera On+FM                              |
| 2                             | GSM1900 Idle + Adapter1 + SIM2 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle + Back Camera On                     |
| 3                             | WCDMA B2 Idle + Adapter1 + SIM1 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle + Front Camera On                   |
| 4                             | WCDMA B4 Idle + Adapter1 + SIM2 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle + Back Camera On+FM                 |
| 5                             | WCDMA B5 Idle + Adapter1 + SIM1 + USB cable 1 + BT Idle + WIFI Idle+FM  |
| 6                             | WCDMA B5 Idle + Adapter1 + SIM1 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle                                     |
| 7                             | LTE B2 Idle + Adapter1 + SIM2 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle                                       |
| 8                             | LTE B4 Idle + Adapter1 + SIM1 + USB cable 1 + BT Idle + WIFI Idle+FM  |
| 9                             | LTE B5 Idle + Adapter1 + SIM1 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle+ MPG4                                 |
| 10                            | LTE B5 Idle + Adapter1 + SIM1 + USB cable 1 +FM+ BT Idle + WIFI Idle  |
| 11                            | LTE B7 Idle + Adapter1 + SIM2 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle+ Front Camera On++FM                  |
| 12                            | LTE B12 Idle + USB Link + Data Transmission + SIM2 + BT Idle + WIFI Idle+ EUT to Notebook + USB cable 1 + Earphone1 |
| 13                            | LTE B12 Idle + USB Link + Data Transmission + SIM2 + BT Idle + WIFI Idle+ EUT to Notebook + USB cable 1 + FM        |
| 14                            | LTE B13 Idle + USB Link + Data Transmission + SIM1 + BT Idle + WIFI Idle+ Notebook to EUT+ USB cable 1 + Earphone1  |
| 15                            | LTE B13 Idle + USB Link + Data Transmission + SIM1 + BT Idle + WIFI Idle+ Notebook to EUT+ USB cable 1 +FM          |
| 16                            | LTE B17 Idle + USB Link + Data Transmission + SIM2 + BT Idle + WIFI Idle+ SD to Notebook + USB cable 1 + Earphone1  |
| 17                            | LTE B17 Idle + USB Link + Data Transmission + SIM2 + BT Idle + WIFI Idle+ SD to Notebook + USB cable +FM            |
| 18                            | LTE B66 Idle + USB Link + Data Transmission + SIM1 + BT Idle + WIFI Idle+ Notebook to SD + USB cable 1 + Earphone1  |
| 19                            | Worst of 1~13+ Earphone2  |
| 20                            | Worst of 1~13+FM  |

|                                |   |
|--------------------------------|---|
| <b>Conducted emission test</b> |   |
| 1                              | GSM850 Idle + Adapter1 + SIM1 + USB cable 1 + BT Idle + WIFI Idle + Front Camera On+FM            |
| 2                              | GSM1900 Idle + Adapter1 + SIM2 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle + Back Camera On   |
| 3                              | WCDMA B2 Idle + Adapter1 + SIM1 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle + Front Camera On |
| 4                              | WCDMA B4 Idle + Adapter1 + SIM2 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle + Back            |



|    |   |
|----|---|
|    | Camera On+FM  |
| 5  | WCDMA B5 Idle + Adapter1 + SIM1 + USB cable 1 + BT Idle + WIFI Idle+FM  |
| 6  | WCDMA B5 Idle + Adapter1 + SIM1 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle                                     |
| 7  | LTE B2 Idle + Adapter1 + SIM2 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle                                       |
| 8  | LTE B4 Idle + Adapter1 + SIM1 + USB cable 1 + BT Idle + WIFI Idle+FM  |
| 9  | LTE B5 Idle + Adapter1 + SIM1 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle+ MPG4                                 |
| 10 | LTE B5 Idle + Adapter1 + SIM1 + USB cable 1 +FM+ BT Idle + WIFI Idle  |
| 11 | LTE B7 Idle + Adapter1 + SIM2 + USB cable 1 + Earphone1 + BT Idle + WIFI Idle+ Front Camera On++FM                  |
| 12 | LTE B12 Idle + USB Link + Data Transmission + SIM2 + BT Idle + WIFI Idle+ EUT to Notebook + USB cable 1 + Earphone1 |
| 13 | LTE B12 Idle + USB Link + Data Transmission + SIM2 + BT Idle + WIFI Idle+ EUT to Notebook + USB cable 1 + FM        |
| 14 | LTE B13 Idle + USB Link + Data Transmission + SIM1 + BT Idle + WIFI Idle+ Notebook to EUT+ USB cable 1 + Earphone1  |
| 15 | LTE B13 Idle + USB Link + Data Transmission + SIM1 + BT Idle + WIFI Idle+ Notebook to EUT+ USB cable 1 +FM          |
| 16 | LTE B17 Idle + USB Link + Data Transmission + SIM2 + BT Idle + WIFI Idle+ SD to Notebook + USB cable 1 + Earphone1  |
| 17 | LTE B17 Idle + USB Link + Data Transmission + SIM2 + BT Idle + WIFI Idle+ SD to Notebook + USB cable +FM            |
| 18 | LTE B66 Idle + USB Link + Data Transmission + SIM1 + BT Idle + WIFI Idle+ Notebook to SD + USB cable 1 + Earphone1  |
| 19 | Worst of 1~13+ Earphone2  |
| 20 | Worst of 1~13+FM  |

**NOTE:**

1. For conducted emission test, Pre-scan all mode, mode 2 was the worst case and only this mode was presented in this report.
2. For radiated emission test, Pre-scan all mode, test mode 2 was the worst case and only this mode was presented in this report



## 1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

### FOR ALL TESTS

| NO. | PRODUCT                              | BRAND         | MODEL NO.     | SERIAL NO.    | FCC ID |
|-----|--------------------------------------|---------------|---------------|---------------|--------|
| 1   | Laptop                               | Lenovo        | Thnikpad L440 | R90FTFKP      | N/A    |
| 4   | Micro SD                             | SAM SUNG      | N/A           | N/A           | N/A    |
| 6   | FM signal generator                  | Rohde&Schwarz | SMB 100A      | 109279        | N/A    |
| 7   | GPS Simulator+Antenna                | TOJOIN        | GNSS-5000A    | E1-010-010119 | N/A    |
| 8   | Universal radio communication tester | Rohde&Schwarz | CMW500        | N/A           | N/A    |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|---|
| 1   | USB Line: Shielded, Detachable 1m;                  |
| 2   | N/A   |
| 3   | N/A   |

## 2 EMISSION TEST

### 2.1 CONDUCTED EMISSION MEASUREMENT

#### 2.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

TEST STANDARD: FCC Part 15, Subpart B (Section: 15.107 a CLASS B)

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB $\mu$ V) |          |
|-----------------------------|------------------------------|----------|
|                             | Quasi-peak                   | Average  |
| 0.15 ~ 0.5                  | 66 to 56                     | 56 to 46 |
| 0.5 ~ 5                     | 56                           | 46       |
| 5 ~ 30                      | 60                           | 50       |

TEST STANDARD: FCC Part 15, Subpart B (Section: 15.107 b CLASS A)

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB $\mu$ V) |         |
|-----------------------------|------------------------------|---------|
|                             | Quasi-peak                   | Average |
| 0.15 ~ 0.5                  | 79                           | 66      |
| 0.5 ~ 30                    | 73                           | 60      |

**NOTE:** 1.The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### 2.1.2 TEST INSTRUMENTS

| Equipment           | Manufacturer  | Model No. | Serial No. | Last Cal.  | Next Cal.   |
|---------------------|---------------|-----------|------------|------------|-------------|
| EMI Test Receiver   | Rohde&Schwarz | ESR3      | 101900     | Mar. 03,21 | Mar. 02, 22 |
| EMC32 test software | Rohde&Schwarz | EMC32     | NA         | NA         | NA          |
| LISN network        | Rohde&Schwarz | ENV216    | 101922     | Feb. 25,21 | Feb. 24, 22 |

**NOTE:** 1. The test was performed in CE shielded room.

### 2.1.3 TEST PROCEDURES

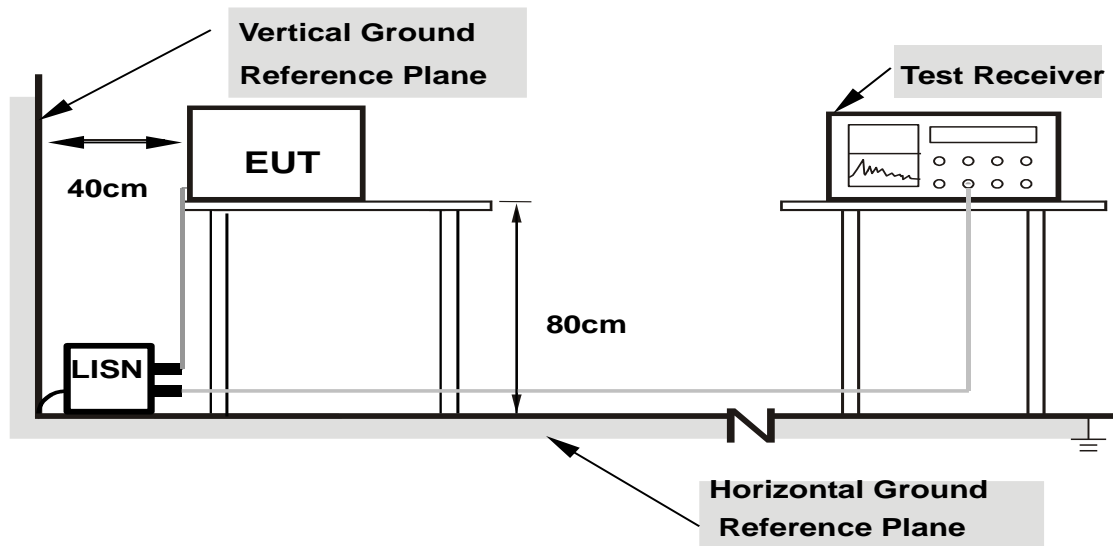
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

### 2.1.4 DEVIATION FROM TEST STANDARD

No deviation.

## 2.1.5 TEST SETUP



- Note: 1.Support units were connected to second LISN.**  
**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

For the actual test configuration, please refer to the attached file (Test Setup Photo).

## 2.1.6 EUT OPERATING CONDITIONS

- Turned on the power and connected of all equipment.
- EUT was operated according to the use type described in the manufacturer's specifications or the user's manual.



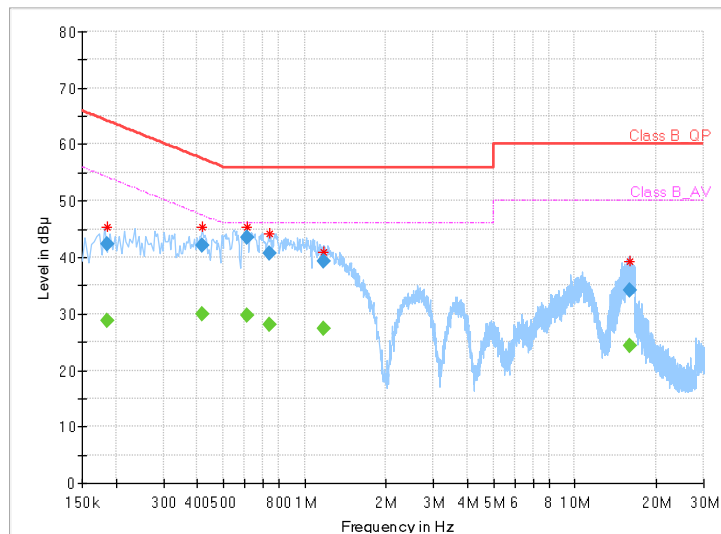
## 2.1.7 TEST RESULTS

|                                 |                      |   |                                       |
|---------------------------------|----------------------|---|---------------------------------------|
| <b>TEST VOLTAGE</b>             | Input 120 Vac, 60 Hz | <b>Detector Function &amp; Resolution Bandwidth</b> | Quasi-Peak (QP) / Average (AV), 9 kHz |
| <b>ENVIRONMENTAL CONDITIONS</b> | 26deg. C, 51%RH      | <b>TESTED BY</b>                                    | Carl xie                              |

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.186000        | ---              | 28.80           | 54.21        | 25.41       | L1   | ON     | 9.7        |
| 0.186000        | 42.30            | ---             | 64.21        | 21.91       | L1   | ON     | 9.7        |
| 0.416000        | ---              | 30.06           | 47.53        | 17.47       | L1   | ON     | 9.7        |
| 0.416000        | 42.22            | ---             | 57.53        | 15.31       | L1   | ON     | 9.7        |
| 0.612000        | ---              | 29.63           | 46.00        | 16.37       | L1   | ON     | 9.7        |
| 0.612000        | 43.59            | ---             | 56.00        | 12.41       | L1   | ON     | 9.7        |
| 0.740000        | ---              | 28.02           | 46.00        | 17.98       | L1   | ON     | 9.7        |
| 0.740000        | 40.66            | ---             | 56.00        | 15.34       | L1   | ON     | 9.7        |
| 1.180000        | ---              | 27.29           | 46.00        | 18.71       | L1   | ON     | 9.7        |
| 1.180000        | 39.34            | ---             | 56.00        | 16.66       | L1   | ON     | 9.7        |
| 16.004000       | ---              | 24.37           | 50.00        | 25.63       | L1   | ON     | 9.8        |
| 16.004000       | 34.07            | ---             | 60.00        | 25.93       | L1   | ON     | 9.8        |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Limit value - Emission level
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.

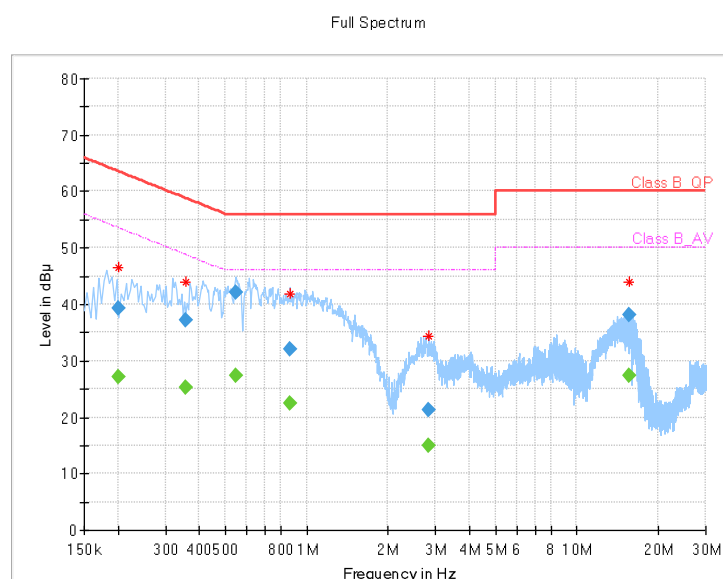
Full Spectrum



|                                 |                      |   |                                       |
|---------------------------------|----------------------|---|---------------------------------------|
| <b>TEST VOLTAGE</b>             | Input 120 Vac, 60 Hz | <b>Detector Function &amp; Resolution Bandwidth</b> | Quasi-Peak (QP) / Average (AV), 9 kHz |
| <b>ENVIRONMENTAL CONDITIONS</b> | 26deg. C, 51%RH      | <b>TESTED BY</b>                                    | Carl xie                              |

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.202000        | ---              | 27.10           | 53.53        | 26.43       | N    | ON     | 9.7        |
| 0.202000        | 39.39            | ---             | 63.53        | 24.14       | N    | ON     | 9.7        |
| 0.356000        | ---              | 25.32           | 48.82        | 23.50       | N    | ON     | 9.7        |
| 0.356000        | 37.22            | ---             | 58.82        | 21.60       | N    | ON     | 9.7        |
| 0.544000        | ---              | 27.37           | 46.00        | 18.63       | N    | ON     | 9.7        |
| 0.544000        | 42.17            | ---             | 56.00        | 13.83       | N    | ON     | 9.7        |
| 0.872000        | ---              | 22.55           | 46.00        | 23.45       | N    | ON     | 9.7        |
| 0.872000        | 32.13            | ---             | 56.00        | 23.87       | N    | ON     | 9.7        |
| 2.824000        | ---              | 14.95           | 46.00        | 31.05       | N    | ON     | 9.8        |
| 2.824000        | 21.30            | ---             | 56.00        | 34.70       | N    | ON     | 9.8        |
| 15.636000       | ---              | 27.26           | 50.00        | 22.74       | N    | ON     | 9.8        |
| 15.636000       | 38.03            | ---             | 60.00        | 21.97       | N    | ON     | 9.8        |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Limit value - Emission level
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



## 2.2 RADIATED EMISSION MEASUREMENT

### 2.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

**TEST STANDARD: FCC Part 15, Subpart B (Section: 15.109)**

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

| Radiated Emissions Limits at 3 meters (dB $\mu$ V/m) |                             |                             |
|--|-----------------------------|-----------------------------|
| Frequencies (MHz)                                    | FCC 15B / ICES-003, Class A | FCC 15B / ICES-003, Class B |
| 30-88  | 49                          | 40                          |
| 88-216   | 53.5                        | 43.5                        |
| 216-960  | 56                          | 46                          |
| 960-1000   | 59.5                        | 54                          |
| Above 1000   | Avg: 59.5<br>Peak: 79.5     | Avg: 54<br>Peak: 74         |

#### Frequency Range (For unintentional radiators)

| Highest frequency generated or used in the device or on which the device operates or tunes (MHz) | Upper frequency of measurement range (MHz)                                     |
|--|--|
| Below 1.705  | 30   |
| 1.705-108  | 1000   |
| 108-500  | 2000   |
| 500-1000   | 5000   |
| Above 1000   | 5 <sup>th</sup> harmonic of the highest frequency or 40GHz, whichever is lower |

- NOTE:**
- The lower limit shall apply at the transition frequencies.
  - Emission level (dBuV/m) = 20 log Emission level (uV/m).
  - As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
  - QP detector shall be applied if not specified.

## 2.2.2 TEST INSTRUMENTS

### Frequency range below 1GHz

| Equipment                | Manufacturer | Model No.  | Serial No.                  | Last Cal.  | Next Cal.  |
|--------------------------|--------------|------------|-----------------------------|------------|------------|
| 3m Semi-anechoic Chamber | ETS-LINDGREN | 9m*6m*6m   | Euroshieldpn-CT0001143-1216 | May. 19,20 | May. 18,23 |
| Bilog Antenna            | ETS-LINDGREN | 3143B      | 00161965                    | Mar. 05,21 | Mar. 04,22 |
| MXE EMI Receiver         | KEYSIGHT     | N9038A-544 | MY54450026                  | Apr. 22,21 | Apr. 21,22 |
| Signal Pre-Amplifier     | EMSI         | EMC 9135   | 980249                      | Jun. 02,21 | Jun. 01,22 |
| E3 Test Software         | E3           | V 9.160323 | N/A                         | N/A        | N/A        |

### Frequency range above 1GHz

| Equipment                | Manufacturer | Model No.   | Serial No.                  | Last Cal.  | Next Cal.  |
|--------------------------|--------------|-------------|-----------------------------|------------|------------|
| 3m Semi-anechoic Chamber | ETS-LINDGREN | 9m*6m*6m    | Euroshieldpn-CT0001143-1216 | May. 19,20 | May. 18,23 |
| Horn Antenna             | ETS-LINDGREN | 3117        | 00168728                    | Apr. 02,21 | Apr. 01,22 |
| MXE EMI Receiver         | KEYSIGHT     | N9038A-544  | MY54450026                  | Apr. 22,21 | Apr. 21,22 |
| Signal Pre-Amplifier     | EMSI         | EMC 012645B | 980257                      | Jun. 03,21 | Jun. 02,22 |
| E3 Test Software         | E3           | V 9.160323  | N/A                         | N/A        | N/A        |

- NOTE:** 1. The test was performed in 3m chamber.  
2. The FCC Site Registration No. is 525120; The Designation No. is CN1171.



## 2.2.3 TEST PROCEDURE

### <Frequency Range below 1GHz>

The basic test procedure was in accordance with ANSI C63.4:2014 (section 12).

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

#### NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2.  $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
3.  $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$  (if the raw value not contains the amplifier);
4.  $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$  (if the raw value contains the amplifier).
5.  $\text{Margin value} = \text{Emission level} - \text{Limit value}$ .

### <Frequency Range above 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter fully-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. The bore sight should be used during the test above 1GHz.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz

#### NOTE:

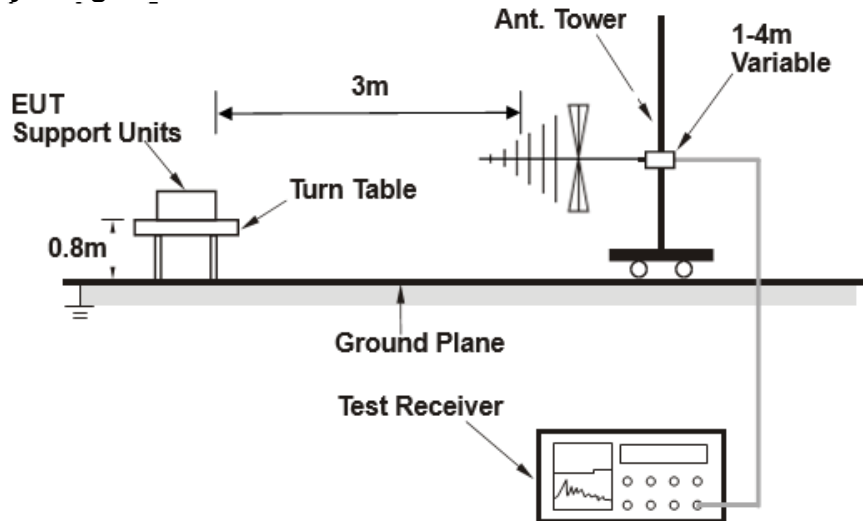
- . The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- . The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth of test receiver/spectrum analyzer is 1Hz for Average detection (AV) at frequency above 1GHz.
- . For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
- . Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
- . Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier);
- . Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier)
- . Margin value = Emission level – Limit value.

## 2.2.4 DEVIATION FROM TEST STANDARD

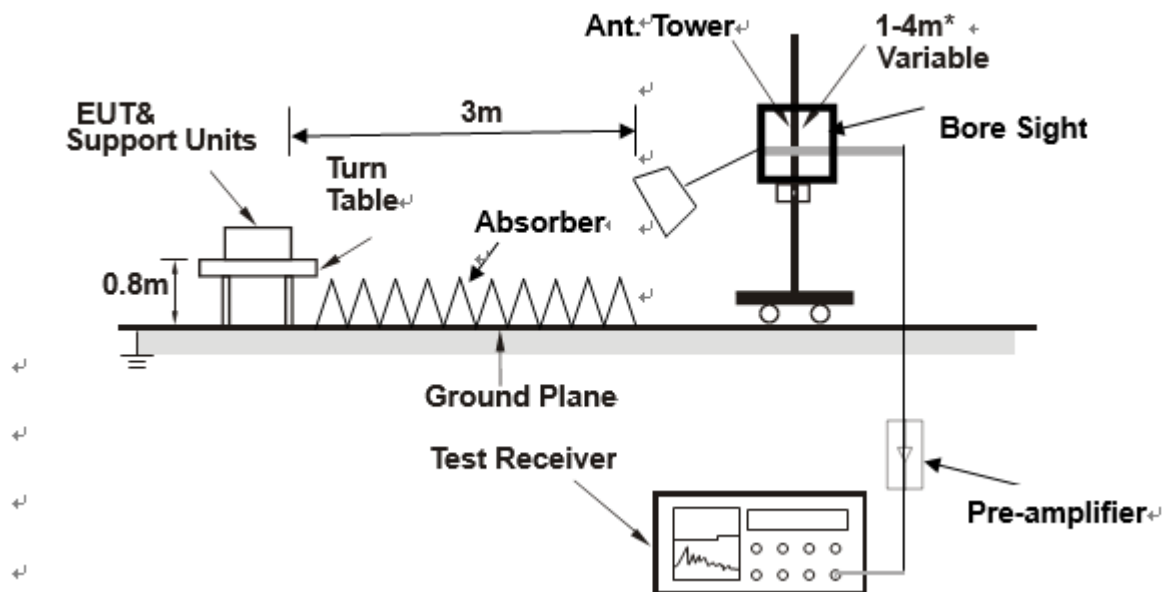
No deviation.

## 2.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



**Note:** Above 1G is a directional antenna

depends on the EUT height and the antenna 3dB bandwidth both, refer to section 7.3 of CISPR 16-2-3.

## 2.2.6 EUT OPERATING CONDITIONS

Same as item 2.1.6.

## 2.2.7 TEST RESULTS

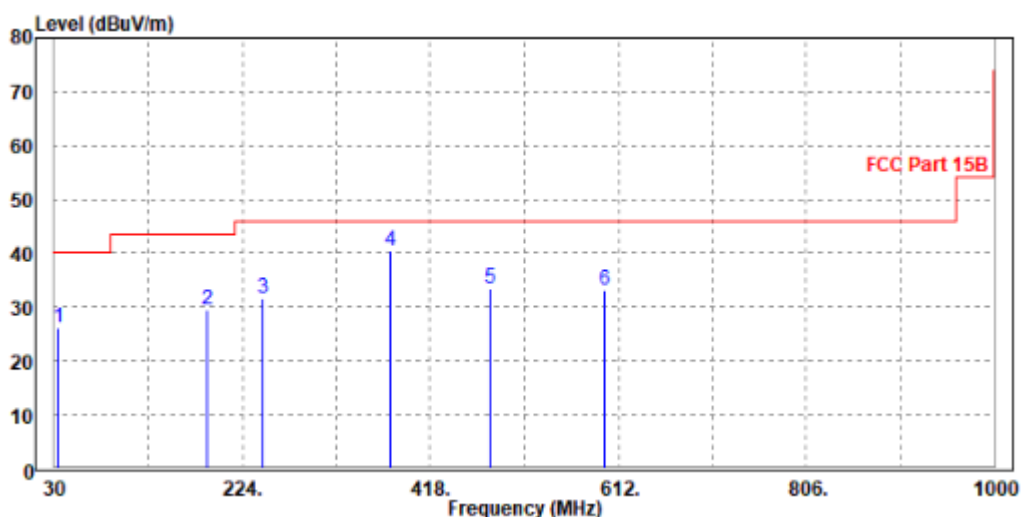
Acceleromete alternative worst case:

|                                     |   |   |                     |
|-------------------------------------|---|---|---------------------|
| <b>TEST VOLTAGE</b>                 | Data Transmission<br>Input 120 Vac, 60 Hz | <b>FREQUENCY RANGE</b>                                      | 30-1000 MHz         |
| <b>ENVIRONMENTAL<br/>CONDITIONS</b> | 23deg. C, 70 %RH                          | <b>DETECTOR FUNCTION<br/>&amp; RESOLUTION<br/>BANDWIDTH</b> | Quasi-Peak, 120 kHz |
| <b>TESTED BY</b>                    | Jace Hu                                   |   |                     |

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

|      | Freq    | Level  | Read<br>Level | Limit<br>Line | Over<br>Limit | Factor | Remark | Pol/Phase  |
|------|---------|--------|---------------|---------------|---------------|--------|--------|------------|
|      | MHz     | dBuV/m | dBuV          | dBuV/m        | dB            | dB/m   |        |            |
| 1    | 33.880  | 26.17  | 44.23         | 40.00         | -13.83        | -18.06 | Peak   | Horizontal |
| 2    | 188.110 | 29.39  | 54.75         | 43.50         | -14.11        | -25.36 | Peak   | Horizontal |
| 3    | 245.340 | 31.65  | 54.48         | 46.00         | -14.35        | -22.83 | Peak   | Horizontal |
| 4 PP | 377.260 | 40.51  | 60.04         | 46.00         | -5.49         | -19.53 | Peak   | Horizontal |
| 5    | 480.080 | 33.55  | 50.99         | 46.00         | -12.45        | -17.44 | Peak   | Horizontal |
| 6    | 598.420 | 33.15  | 48.48         | 46.00         | -12.85        | -15.33 | Peak   | Horizontal |

- REMARKS:**
1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)- Amplifier Gain
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.



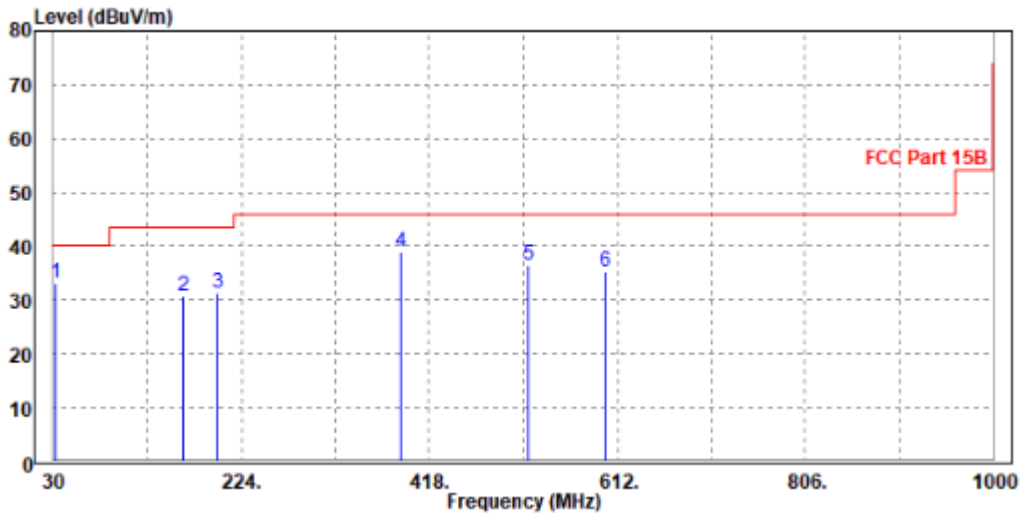


|                                 |   |   |                      |
|---------------------------------|---|---|----------------------|
| <b>TEST VOLTAGE</b>             | Data Transmission<br>Input 120 Vac, 60 Hz | <b>FREQUENCY RANGE</b>                              | 30-1000 MHz          |
| <b>ENVIRONMENTAL CONDITIONS</b> | 23deg. C, 70% RH                          | <b>DETECTOR FUNCTION &amp; RESOLUTION BANDWIDTH</b> | Quasi-Peak , 120 kHz |
| <b>TESTED BY</b>                | Jace Hu                                   |   |                      |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

|   | Freq | Level   | Read Level | Limit Line | Over Limit | Factor | Remark      | Pol/Phase |
|---|------|---------|------------|------------|------------|--------|-------------|-----------|
|   | MHz  | dBuV/m  | dBuV       | dBuV/m     | dB         | dB/m   |             |           |
| 1 | PP   | 32.910  | 33.04      | 51.27      | 40.00      | -6.96  | -18.23 Peak | Vertical  |
| 2 |      | 163.860 | 30.70      | 55.46      | 43.50      | -12.80 | -24.76 Peak | Vertical  |
| 3 |      | 199.750 | 31.34      | 55.68      | 43.50      | -12.16 | -24.34 Peak | Vertical  |
| 4 |      | 388.900 | 38.98      | 57.79      | 46.00      | -7.02  | -18.81 Peak | Vertical  |
| 5 |      | 519.850 | 36.57      | 52.93      | 46.00      | -9.43  | -16.36 Peak | Vertical  |
| 6 |      | 599.390 | 35.36      | 50.48      | 46.00      | -10.64 | -15.12 Peak | Vertical  |

- REMARKS:**
1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
  2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) -Amplifier Gain
  3. The other emission levels were very low against the limit.
  4. Margin value = Emission level – Limit value.

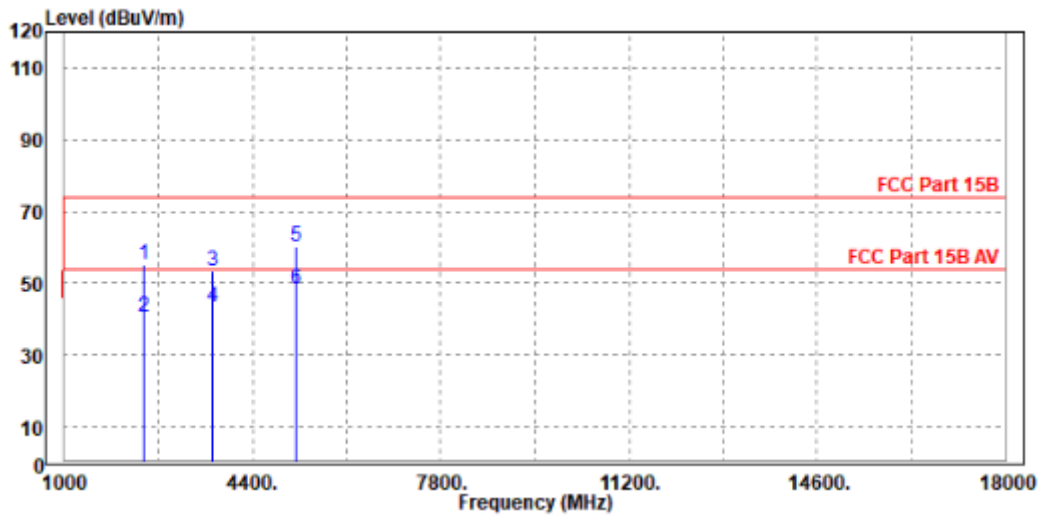




|                                 |   |   |                     |
|---------------------------------|---|---|---------------------|
| <b>TEST VOLTAGE</b>             | Data Transmission<br>Input 120 Vac, 60 Hz | <b>FREQUENCY RANGE</b>                              | 1-18 GHz            |
| <b>ENVIRONMENTAL CONDITIONS</b> | 23deg. C, 70 %RH                          | <b>DETECTOR FUNCTION &amp; RESOLUTION BANDWIDTH</b> | Peak/Average, 1 MHz |
| <b>TESTED BY</b>                | Jace Hu                                   |   |                     |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                         |                   |                |             |                        |                 |                    |                     |                      |         |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz)   | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK  |
| 2428  | 55.01                   | 63.6              | 74             | -18.99      | 31.87                  | 5.91            | 46.37              | 100                 | 154                  | Peak    |
| 2428  | 40.8                    | 49.39             | 54             | -13.2       | 31.87                  | 5.91            | 46.37              | 100                 | 154                  | Average |
| 3669  | 53.32                   | 59.11             | 74             | -20.68      | 33.1                   | 7.49            | 46.38              | 100                 | 172                  | Peak    |
| 3669  | 43.15                   | 48.94             | 54             | -10.85      | 33.1                   | 7.49            | 46.38              | 100                 | 172                  | Average |
| 5182  | 60.15                   | 62.37             | 74             | -13.85      | 34.55                  | 9.58            | 46.35              | 100                 | 65                   | Peak    |
| 5182  | 48.49                   | 50.71             | 54             | -5.51       | 34.55                  | 9.58            | 46.35              | 100                 | 65                   | Average |

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
  2. Negative sign (-) in the margin column signify levels below the limit.
  3. Frequency range scanned: 1GHz to 18GHz.
  4. Only emissions significantly above equipment noise floor are reported.

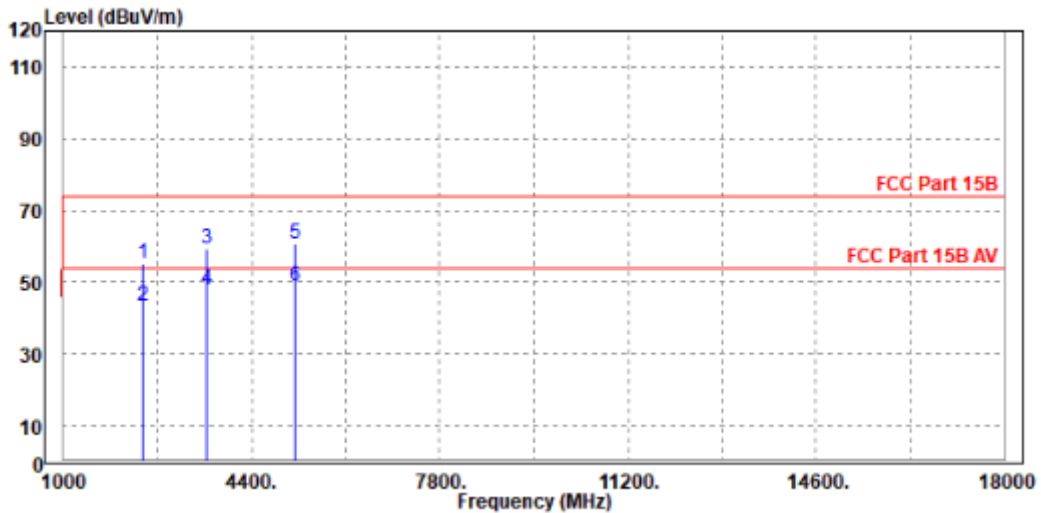




|                                 |   |   |                     |
|---------------------------------|---|---|---------------------|
| <b>TEST VOLTAGE</b>             | Data Transmission<br>Input 120 Vac, 60 Hz | <b>FREQUENCY RANGE</b>                              | 1-18 GHz            |
| <b>ENVIRONMENTAL CONDITIONS</b> | 23deg. C, 70 %RH                          | <b>DETECTOR FUNCTION &amp; RESOLUTION BANDWIDTH</b> | Peak/Average, 1 MHz |
| <b>TESTED BY</b>                | Jace Hu                                   |   |                     |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                         |                   |                |             |                        |                 |                    |                     |                      |         |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz)                                       | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK  |
| 2428  | 55.24                   | 63.47             | 74             | -18.76      | 32.23                  | 5.91            | 46.37              | 200                 | 154                  | Peak    |
| 2428  | 43.34                   | 51.57             | 54             | -10.66      | 32.23                  | 5.91            | 46.37              | 200                 | 154                  | Average |
| 3601  | 59.45                   | 65.58             | 74             | -14.55      | 32.96                  | 7.29            | 46.38              | 200                 | 89                   | Peak    |
| 3601  | 47.75                   | 53.88             | 54             | -6.25       | 32.96                  | 7.29            | 46.38              | 200                 | 89                   | Average |
| 5182  | 60.46                   | 62.63             | 74             | -13.54      | 34.6                   | 9.58            | 46.35              | 200                 | 169                  | Peak    |
| 5182  | 48.67                   | 50.84             | 54             | -5.33       | 34.6                   | 9.58            | 46.35              | 200                 | 169                  | Average |

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
  2. Negative sign (-) in the margin column signify levels below the limit.
  3. Frequency range scanned: 1GHz to 18GHz.
  4. Only emissions significantly above equipment noise floor are reported.





### **3 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications were made to the EUT by the lab during the test.

**---END---**