

## Supplemental “Transmit Simultaneously” Test Report

**Report No.:** RF200204C24-5

**FCC ID:** A4R-G4CVZ

**Test Model:** G4CVZ

**Received Date:** Feb. 04, 2020

**Test Date:** June 14 to 15, 2020

**Issued Date:** June 24, 2020

**Applicant:** GOOGLE LLC

**Address:** 1600 Amphitheatre Parkway Mountain View, CA 94043

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**FCC Registration /  
Designation Number:** 723255 / TW2022



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### Release Control Record

| Issue No.     | Description       | Date Issued   |
|---------------|-------------------|---------------|
| RF200204C24-5 | Original release. | June 24, 2020 |

## 1 Certificate of Conformity

**Product:** Thermostat  
**Test Model:** G4CVZ  
**Sample Status:** Engineering Sample  
**Applicant:** GOOGLE LLC  
**Test Date:** June 14 to 15, 2020  
**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
47 CFR FCC Part 15, Subpart C (Section 15.255)  
47 CFR FCC Part 15, Subpart E (Section 15.407)  
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** Phoenix Huang, **Date:** June 24, 2020  
Phoenix Huang / Specialist

**Approved by :** Wen Yu, **Date:** June 24, 2020  
Wen Yu / Supervisor

## 2 Summary of Test Results

| FCC Part 15, Subpart C, E (SECTION 15.247, 15.255, 15.407)                        |                                                 |        |                                                                                          |
|-----------------------------------------------------------------------------------|-------------------------------------------------|--------|------------------------------------------------------------------------------------------|
| FCC Clause                                                                        | Test Item                                       | Result | Remarks                                                                                  |
| 15.205 / 15.209 /<br>15.247(d)<br>15.255 (d)(2)<br>15.407(b)<br>(1/2/3/4(i/ii)/6) | Radiated Emissions and Band<br>Edge Measurement | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -10.3 dB at<br>17983.00 MHz. |

Note:

Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

### 2.1 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:

| Measurement                    | Frequency      | Expanded Uncertainty<br>(k=2) ( $\pm$ ) |
|--------------------------------|----------------|-----------------------------------------|
| Radiated Emissions up to 1 GHz | 9kHz ~ 30MHz   | 5.1 dB                                  |
|                                | 30MHz ~ 1GHz   | 5.1 dB                                  |
| Radiated Emissions above 1 GHz | 1GHz ~ 18GHz   | 5.3 dB                                  |
|                                | 18GHz ~ 40GHz  | 5.4 dB                                  |
|                                | 40GHz ~ 200GHz | 5.4 dB                                  |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product                         | Thermostat                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Test Model                      | G4CVZ                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Status of EUT                   | Normal Operating Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Battery Nominal Voltage         | 3 Vdc                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Battery Voltage Operation Range | 2.55 – 3.45 Vdc                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Modulation Type                 | <b>WLAN:</b><br>CCK, DQPSK, DBPSK for DSSS<br>64QAM, 16QAM, QPSK, BPSK for OFDM<br><b>BT-LE:</b> GFSK<br><b>60GHz Radar:</b> FMCW                                                                                                                                                                                                                                                                                                                                               |
| Modulation Technology           | <b>WLAN:</b> OFDM<br><b>60GHz Radar:</b> Pulse<br><b>BT-LE:</b> DTS                                                                                                                                                                                                                                                                                                                                                                                                             |
| Transfer Rate                   | <b>WLAN:</b><br>802.11a: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps<br>802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps<br>802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps<br>802.11n: up to 72.2 Mbps<br><b>BT-LE:</b> 1 Mbps                                                                                                                                                                                                                              |
| Operating Frequency             | <b>WLAN (2.4GHz):</b> 2.412 ~ 2.462 GHz<br><b>WLAN (5GHz):</b> 5.18 ~ 5.24 GHz, 5.26 ~ 5.32 GHz, 5.5 ~ 5.7 GHz, 5.745 ~ 5.825 GHz<br><b>BT-LE:</b> 2.402 ~ 2.480 GHz<br><b>60GHz Radar:</b> 61 ~ 61.5 GHz                                                                                                                                                                                                                                                                       |
| Antenna Gain                    | <b>WLAN (2.4GHz):</b> PIFA antenna with 1.09 dBi gain<br><b>WLAN (5GHz):</b><br>PIFA antenna with 3.20 dBi gain (5.18 ~ 5.24 GHz)<br>PIFA antenna with 1.96 dBi gain (5.26 ~ 5.32 GHz)<br>PIFA antenna with 1.30 dBi gain (5.5 ~ 5.7 GHz)<br>PIFA antenna with 1.95 dBi gain (5.745 ~ 5.825 GHz)<br><b>BT-LE:</b> PIFA antenna with 1.09 dBi gain<br><b>60GHz Radar:</b> 5 dBi, <input checked="" type="checkbox"/> Specified by manufacturer <input type="checkbox"/> Measured |
| Antenna Connector               | NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Accessory Device                | Refer to Notes as below                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Data Cable Supplied             | Refer to Notes as below                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 3.1.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO |       | DESCRIPTION                 |
|--------------------|---------------|-------|-----------------------------|
|                    | RE $\geq$ 1G  | RE<1G |                             |
| 1                  | √             | √     | WLAN (2.4GHz) + 60GHz Radar |
| 2                  | √             | √     | WLAN (5GHz) + 60GHz Radar   |
| 3                  | √             | √     | BT-LE + 60GHz Radar         |

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement

**RE<1G**: Radiated Emission below 1GHz

**Note:** The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.

#### Radiated Emission Test (Above 1GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

| Available Mode | Available Channel                    | Tested Channel | Modulation Technology | Modulation Type |
|----------------|--------------------------------------|----------------|-----------------------|-----------------|
| 1              | 1 to 11                              | 11             | DSSS                  | DBPSK           |
|                | 1                                    | 1              | Pulse                 | FMCW            |
| 2              | 36 to 64<br>100 to 140<br>149 to 165 | 100            | OFDM                  | BPSK            |
|                | 1                                    | 1              | Pulse                 | FMCW            |
| 3              | 0 to 39                              | 0              | DTS                   | GFSK            |
|                | 1                                    | 1              | Pulse                 | FMCW            |

#### Radiated Emission Test (Below 1GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

| Available Mode | Available Channel                    | Tested Channel | Modulation Technology | Modulation Type |
|----------------|--------------------------------------|----------------|-----------------------|-----------------|
| 1              | 1 to 11                              | 11             | DSSS                  | DBPSK           |
|                | 1                                    | 1              | Pulse                 | FMCW            |
| 2              | 36 to 64<br>100 to 140<br>149 to 165 | 100            | OFDM                  | BPSK            |
|                | 1                                    | 1              | Pulse                 | FMCW            |
| 3              | 0 to 39                              | 0              | DTS                   | GFSK            |
|                | 1                                    | 1              | Pulse                 | FMCW            |

#### Test Condition:

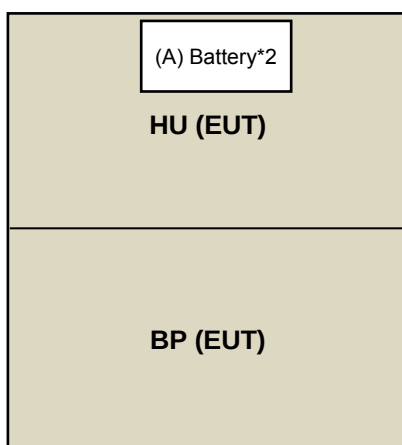
| APPLICABLE TO | ENVIRONMENTAL CONDITIONS                                | INPUT POWER | TESTED BY |
|---------------|---------------------------------------------------------|-------------|-----------|
| RE $\geq$ 1G  | 19deg. C, 67%RH                                         | 3Vdc        | Weiwei Lo |
| RE<1G         | 24deg. C, 64%RH,<br>25deg. C, 68%RH,<br>23deg. C, 62%RH | 3Vdc        | Weiwei Lo |

### 3.2 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.

| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks         |
|----|---------|-------|-----------|------------|--------|-----------------|
| A. | Battery | NA    | AAA       | NA         | NA     | Provided by Lab |

#### 3.2.1 Configuration of System under Test



## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

##### For 47 CFR FCC Part 15, Subpart C, E (15.247, 15.407):

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009 ~ 0.490     | 2400/F(kHz)                       | 300                           |
| 0.490 ~ 1.705     | 24000/F(kHz)                      | 30                            |
| 1.705 ~ 30.0      | 30                                | 30                            |
| 30 ~ 88           | 100                               | 3                             |
| 88 ~ 216          | 150                               | 3                             |
| 216 ~ 960         | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

##### Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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.

##### Limits of unwanted emission out of the restricted bands

| Applicable To                                                                                    |                                     |                  | Limit                                                                                                                               |                                                                                                                                         |
|--------------------------------------------------------------------------------------------------|-------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 789033 D02 General UNII Test Procedure<br>New Rules v02r01                                       |                                     |                  | Field Strength at 3m                                                                                                                |                                                                                                                                         |
|                                                                                                  |                                     |                  | PK:74 (dBμV/m)                                                                                                                      | AV:54 (dBμV/m)                                                                                                                          |
| Frequency Band                                                                                   | Applicable To                       |                  | EIRP Limit                                                                                                                          | Equivalent Field Strength at 3m                                                                                                         |
| 5150~5250 MHz                                                                                    | 15.407(b)(1)                        |                  | PK:-27 (dBm/MHz)                                                                                                                    | PK:68.2(dBμV/m)                                                                                                                         |
| 5250~5350 MHz                                                                                    | 15.407(b)(2)                        |                  |                                                                                                                                     |                                                                                                                                         |
| 5470~5725 MHz                                                                                    | 15.407(b)(3)                        |                  |                                                                                                                                     |                                                                                                                                         |
| 5725~5850 MHz                                                                                    | <input checked="" type="checkbox"/> | 15.407(b)(4)(i)  | PK:-27 (dBm/MHz) <sup>*1</sup><br>PK:10 (dBm/MHz) <sup>*2</sup><br>PK:15.6 (dBm/MHz) <sup>*3</sup><br>PK:27 (dBm/MHz) <sup>*4</sup> | PK: 68.2(dBμV/m) <sup>*1</sup><br>PK:105.2 (dBμV/m) <sup>*2</sup><br>PK: 110.8(dBμV/m) <sup>*3</sup><br>PK:122.2 (dBμV/m) <sup>*4</sup> |
|                                                                                                  | <input type="checkbox"/>            | 15.407(b)(4)(ii) | Emission limits in section 15.247(d)                                                                                                |                                                                                                                                         |
| <sup>*1</sup> beyond 75 MHz or more above of the band edge.                                      |                                     |                  | <sup>*2</sup> below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.                                                |                                                                                                                                         |
| <sup>*3</sup> below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. |                                     |                  | <sup>*4</sup> from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.                |                                                                                                                                         |

##### Note:

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000 \sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts).}$$

**For 47 CFR FCC Part 15, Subpart C (15.255)**

| Spurious Emission                                                                                    |                                   |
|------------------------------------------------------------------------------------------------------|-----------------------------------|
| Frequency Range                                                                                      | Limitation                        |
| Radiated emissions below 40GHz                                                                       | Part 15.209                       |
| Between 40GHz and 200GHz                                                                             | 90pW/cm <sup>2</sup> (at 3 meter) |
| Note:<br>The levels of the spurious emissions shall not exceed the level of the fundamental emission |                                   |

#### 4.1.2 Test Instruments

##### For Radiated Emission (Below 40GHz):

| DESCRIPTION & MANUFACTURER                          | MODEL NO.            | SERIAL NO.  | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------------------------|----------------------|-------------|-----------------|------------------|
| Test Receiver<br>R&S                                | ESR7                 | 102026      | Apr. 22, 2020   | Apr. 21, 2021    |
| Spectrum Analyzer<br>Keysight                       | N9030B               | MY57141948  | May 22, 2020    | May 21, 2021     |
| Pre-Amplifier<br>EMCI                               | EMC001340            | 980142      | May 25, 2020    | May 24, 2021     |
| Loop Antenna<br>Electro-Metrics                     | EM-6879              | 264         | Feb. 18, 2020   | Feb. 17, 2021    |
| RF Cable                                            | NA                   | LOOPCAB-001 | Jan. 08, 2020   | Jan. 07, 2021    |
| RF Cable                                            | NA                   | LOOPCAB-002 | Jan. 08, 2020   | Jan. 07, 2021    |
| Pre-Amplifier<br>EMCI                               | EMC330N              | 980538      | Apr. 28, 2020   | Apr. 27, 2021    |
| Trilog Broadband Antenna<br>SCHWARZBECK             | VULB9168             | 9168-0842   | Nov. 08, 2019   | Nov. 07, 2020    |
| RF Cable                                            | 8D                   | 966-5-1     | Apr. 29, 2020   | Apr. 28, 2021    |
| RF Cable                                            | 8D                   | 966-5-2     | Apr. 29, 2020   | Apr. 28, 2021    |
| RF Cable                                            | 8D                   | 966-5-3     | Apr. 29, 2020   | Apr. 28, 2021    |
| Fixed attenuator<br>Mini-Circuits                   | UNAT-5+              | PAD-ATT5-02 | Jan. 14, 2020   | Jan. 13, 2021    |
| Horn_Antenna<br>SCHWARZBECK                         | BBHA 9120D           | 9120D-1819  | Nov. 24, 2019   | Nov. 23, 2020    |
| Pre-Amplifier<br>EMCI                               | EMC12630SE           | 980509      | Apr. 29, 2020   | Apr. 28, 2021    |
| RF Cable<br>EMCI                                    | EMC104-SM-SM-1500    | 180503      | Apr. 29, 2020   | Apr. 28, 2021    |
| RF Cable<br>EMCI                                    | EMC104-SM-SM-2000    | 180501      | Apr. 29, 2020   | Apr. 28, 2021    |
| RF Cable<br>EMCI                                    | EMC104-SM-SM-6000    | 180506      | Apr. 29, 2020   | Apr. 28, 2021    |
| Pre-Amplifier<br>EMCI                               | EMC184045SE          | 980387      | Jan. 15, 2020   | Jan. 14, 2021    |
| Horn_Antenna<br>SCHWARZBECK                         | BBHA 9170            | BBHA9170519 | Nov. 24, 2019   | Nov. 23, 2020    |
| RF Cable                                            | EMC102-KM-KM-1200    | 160924      | Jan. 15, 2020   | Jan. 14, 2021    |
| RF Cable                                            | EMC-KM-KM-4000       | 200214      | Mar. 11, 2020   | Mar. 10, 2021    |
| Software                                            | ADT_Radiated_V8.7.08 | NA          | NA              | NA               |
| Boresight Antenna Tower &<br>Turn Table<br>Max-Full | MF-7802BS            | MF780208530 | NA              | NA               |

##### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 5.
3. Loop antenna was used for all emissions below 30 MHz.
- 4 Tested Date: June 14, 2020

**For Other Test (Above 40 GHz):**

| DESCRIPTION & MANUFACTURER                                                         | MODEL NO.          | SERIAL NO.  | CALIBRATED DATE | CALIBRATED UNTIL |
|------------------------------------------------------------------------------------|--------------------|-------------|-----------------|------------------|
| Spectrum Analyzer Keysight                                                         | N9030A             | MY55330160  | Feb. 07, 2020   | Feb. 06, 2021    |
| *Horn Antenna (33~55GHz) OML                                                       | M22RH              | 110215-1    | Oct. 17, 2017   | Oct. 16, 2020    |
| *Horn Antenna (50~75GHz) OML                                                       | M15HWD             | 110215-1    | Oct. 17, 2017   | Oct. 16, 2020    |
| *Horn Antenna (75~110GHz) OML                                                      | M10RH              | 110215-1    | Oct. 17, 2017   | Oct. 16, 2020    |
| *Horn Antenna(110~170GHz) OML                                                      | M06HWD             | 110215-1    | Oct. 17, 2017   | Oct. 16, 2020    |
| *Horn Antenna (140~220GHz) OML                                                     | M05RH              | 110215-1    | Oct. 17, 2017   | Oct. 16, 2020    |
| **Conical Horn Antenna (50~75GHz) Keysight                                         | WR15CH-Conical     | WR15CH_001  | Jan. 20, 2020   | Jan. 19, 2022    |
| N9029AV15-DC9 - 50-75 GHz VDI Standard Downconverter with 9VDC supply Keysight     | SA Extension WR15  | SAX 381     | CoC             | CoC              |
| N9029AV10-DC9 - 75-110 GHz VDI Standard Downconverter with 9VDC supply Keysight    | SA Extension WR10  | SAX 378     | CoC             | CoC              |
| N9029AV06-DC9 - 110-170 GHz VDI Standard Downconverter with 9VDC supply Keysight   | SA Extension WR6.5 | SAX 377     | CoC             | CoC              |
| **N9029AV05-DC9 - 140-220 GHz VDI Standard Downconverter with 9VDC supply Keysight | SA Extension WR5.1 | SAX 375     | Dec. 09, 2019   | Dec. 08, 2021    |
| *Millimeter-Wave Signal Generator Frequency Extension Module (50~75 GHz) Keysight  | E8257DV15          | SGX 050     | CoC             | CoC              |
| PSG analog signal generator Keysight                                               | E8257D             | MY53401987  | June 21, 2019   | June 20, 2020    |
| Boresight Antenna Tower & Turn Table Max-Full                                      | MF-7802BS          | MF780208530 | NA              | NA               |
| DC Power Supply Topward                                                            | 6603D              | 795558      | NA              | NA               |
| Temperature & Humidity Chamber Giant Force                                         | GTH-150-40-SP-AR   | MAA0812-008 | Jan. 16, 2020   | Jan. 15, 2021    |
| Voltage Meter FLUKE                                                                | 179                | 89610322    | Sep. 25, 2019   | Sep. 24, 2020    |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. \*The calibration interval of the above test instruments is 36 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. \*\*The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
4. Certificate of Conformance (CoC) which is issued by manufacturer states that the product meets the specification.
5. The test was performed in 966 Chamber No. 6
6. Tested Date: June 15, 2020

#### 4.1.3 Test Procedures

##### **For Radiated emission below 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case 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.

##### **Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

##### **For Radiated emission above 30MHz to 40GHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. 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.
- 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 1 GHz.
- f. 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. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### **Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

**For Radiated emission above 40GHz**

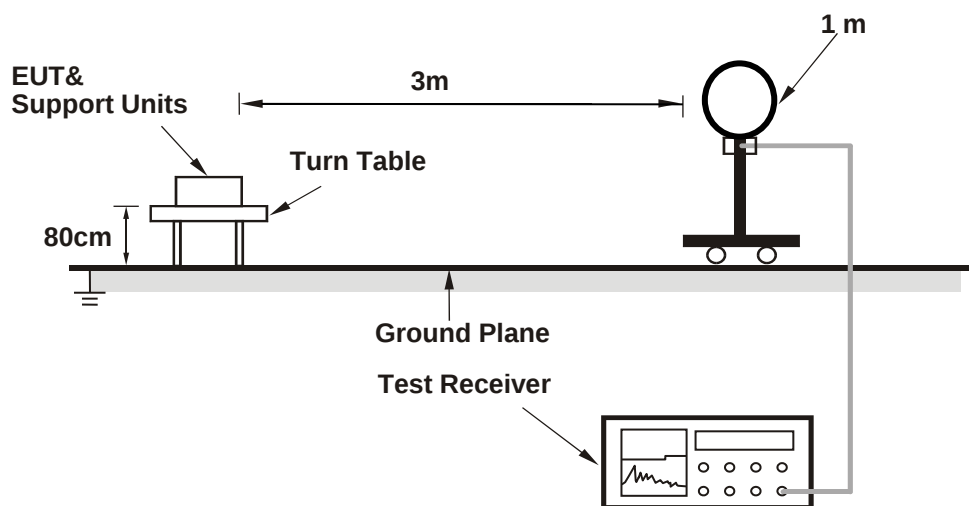
- a. Connect the test antenna covering the appropriate frequency range to a spectrum analyzer via an external mixer to the spectrum analyzer.
- b. Set spectrum analyzer RBW = 1 MHz, VBW = 3 MHz, average detector.
- c. Calculate the distance to the far field boundary and determine the maximum measurement distance.
- d. Perform an exploratory search for emissions and determine the approximate direction at which each observed emission emanates from the EUT.
- e. Exploratory measurements be made at a closer distance than the validated maximum measurement distance.
- f. Perform a final measurement; begin with the test antenna at the approximate position where the maximum level occurred during the exploratory scan.
- g. Slowly scan the test antenna around this position, slowly vary the test antenna polarization by rotating through at least 0° to 180°, and slowly vary the orientation of the test antenna to find the final position, polarization, and orientation at which the maximum level of the emission is observed.
- h. Record the measured reading with the test antenna fixed at this maximized position, polarization, and orientation. Record the measurement distance.
- i. Calculate the maximum field strength of the emission at the measurement distance and the adjusted/corrected power at the output of the test antenna.
- j. Calculate the EIRP from the measured field strength and then convert to the linear.
- k. Calculate the power density at the distance specified by the limit from the field strength at the distance specified by the limit.
- l. Repeat the preceding sequence for every emission observed in the frequency band under investigation.

**4.1.4 Deviation from Test Standard**

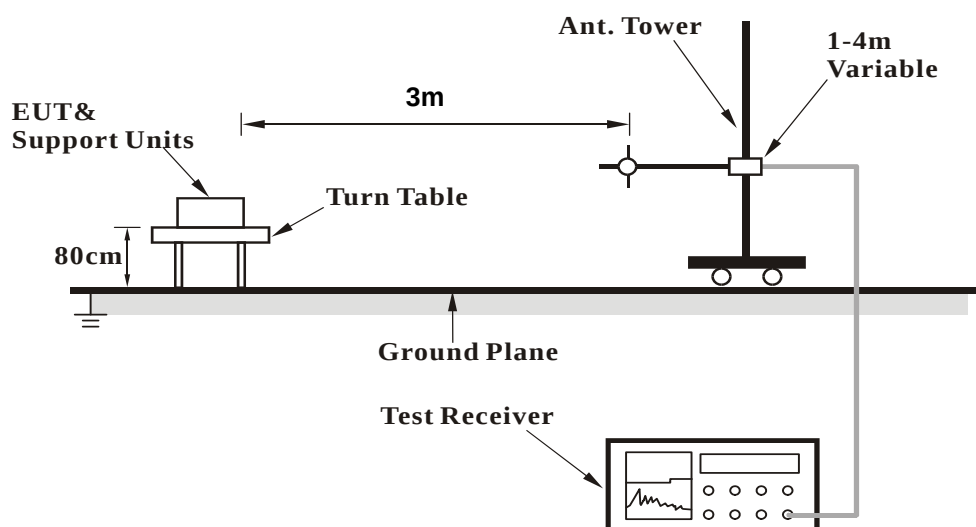
No deviation.

#### 4.1.5 Test Setup

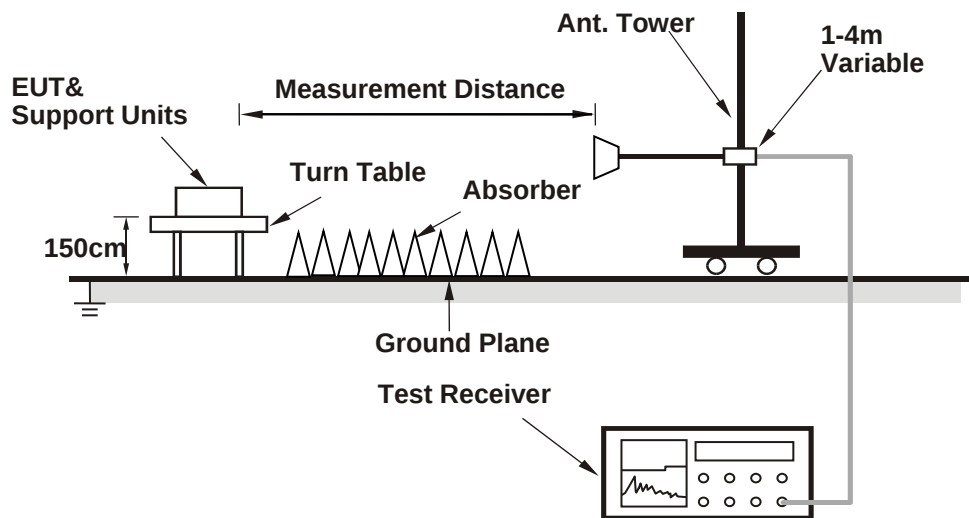
##### For Radiated emission below 30MHz



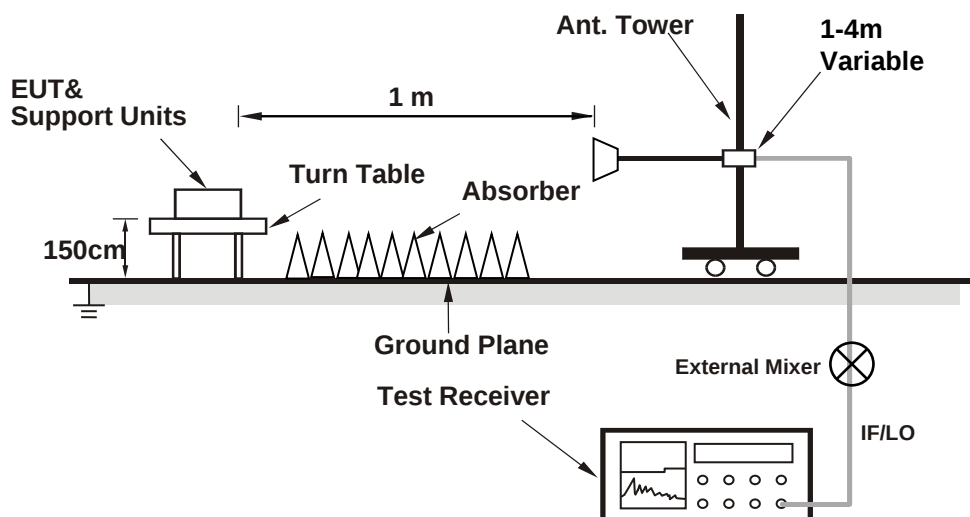
##### For Radiated emission 30MHz to 1GHz



#### For Radiated emission 1GHz to 40GHz



#### For Radiated emission above 40 GHz



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

#### KDB 414788 OATS and Chamber Correlation Justification

- Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in regulations; however, an attempt should be made to avoid making measurements in the near field.
- Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

#### 4.1.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

#### 4.1.7 Test Results (Mode 1)

Above 1GHz Data:

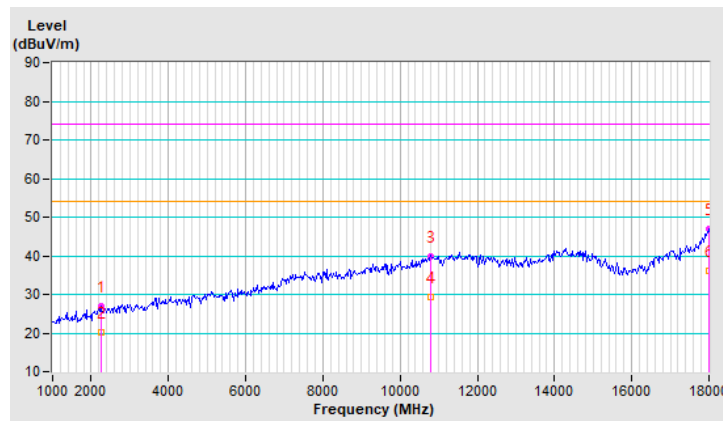
For 1~18GHz

|                 |              |                   |                           |
|-----------------|--------------|-------------------|---------------------------|
| Frequency Range | 1GHz ~ 18GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|--------------|-------------------|---------------------------|

| Antenna Polarity & Test Distance : Horizontal at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|------------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                   | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                    | 2241.00         | 26.9 PK                 | 74.0           | -47.1       | 1.58 H             | 117                  | 29.5             | -2.6                     |
| 2                                                    | 2241.00         | 20.1 AV                 | 54.0           | -33.9       | 1.58 H             | 117                  | 22.7             | -2.6                     |
| 3                                                    | 10792.00        | 40.0 PK                 | 74.0           | -34.0       | 2.97 H             | 118                  | 27.7             | 12.3                     |
| 4                                                    | 10792.00        | 29.4 AV                 | 54.0           | -24.6       | 2.97 H             | 118                  | 17.1             | 12.3                     |
| 5                                                    | 17983.00        | 47.0 PK                 | 74.0           | -27.0       | 1.47 H             | 116                  | 22.1             | 24.9                     |
| 6                                                    | 17983.00        | 36.2 AV                 | 54.0           | -17.8       | 1.47 H             | 116                  | 11.3             | 24.9                     |

#### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

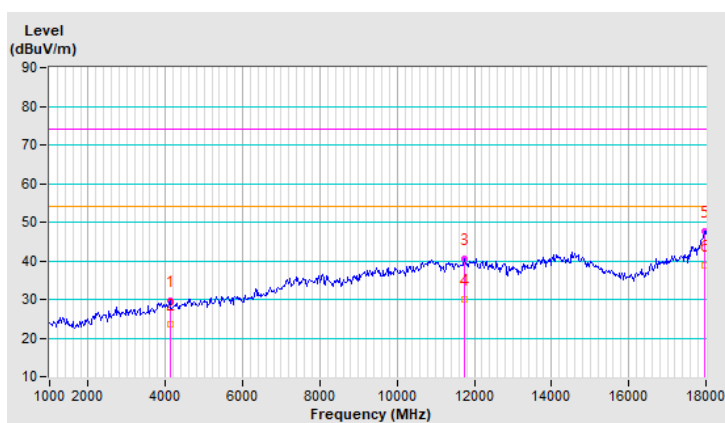


|                 |              |                   |                           |
|-----------------|--------------|-------------------|---------------------------|
| Frequency Range | 1GHz ~ 18GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|--------------|-------------------|---------------------------|

| Antenna Polarity & Test Distance : Vertical at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                 | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                  | 4111.00         | 29.6 PK                 | 74.0           | -44.4       | 1.60 V             | 120                  | 29.9             | -0.3                     |
| 2                                                  | 4111.00         | 23.5 AV                 | 54.0           | -30.5       | 1.60 V             | 120                  | 23.8             | -0.3                     |
| 3                                                  | 11744.00        | 40.6 PK                 | 74.0           | -33.4       | 2.98 V             | 119                  | 28.2             | 12.4                     |
| 4                                                  | 11744.00        | 30.1 AV                 | 54.0           | -23.9       | 2.98 V             | 119                  | 17.7             | 12.4                     |
| 5                                                  | 17949.00        | 47.7 PK                 | 74.0           | -26.3       | 1.47 V             | 124                  | 23.5             | 24.2                     |
| 6                                                  | 17949.00        | 38.8 AV                 | 54.0           | -15.2       | 1.47 V             | 124                  | 14.6             | 24.2                     |

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



### For 18~40GHz

|                 |               |                   |                           |
|-----------------|---------------|-------------------|---------------------------|
| Frequency Range | 18GHz ~ 40GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|---------------|-------------------|---------------------------|

| Antenna Polarity: Horizontal |             |                         |                |             |                    |                      |                  |                          |
|------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.                          | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1                            | 23016.00    | 34.5 PK                 | 74.0           | -39.5       | 1.51 H             | 261                  | 47.1             | -12.6                    |
| 2                            | 23016.00    | 31.8 AV                 | 54.0           | -22.2       | 1.51 H             | 261                  | 44.4             | -12.6                    |
| 3                            | 32806.00    | 38.3 PK                 | 74.0           | -35.7       | 1.54 H             | 141                  | 49.1             | -10.8                    |
| 4                            | 32806.00    | 33.7 AV                 | 54.0           | -20.3       | 1.54 H             | 141                  | 44.5             | -10.8                    |
| 5                            | 39120.00    | 43.0 PK                 | 74.0           | -31.0       | 1.53 H             | 357                  | 47.1             | -4.1                     |
| 6                            | 39120.00    | 38.7 AV                 | 54.0           | -15.3       | 1.53 H             | 357                  | 42.8             | -4.1                     |

#### REMARKS:

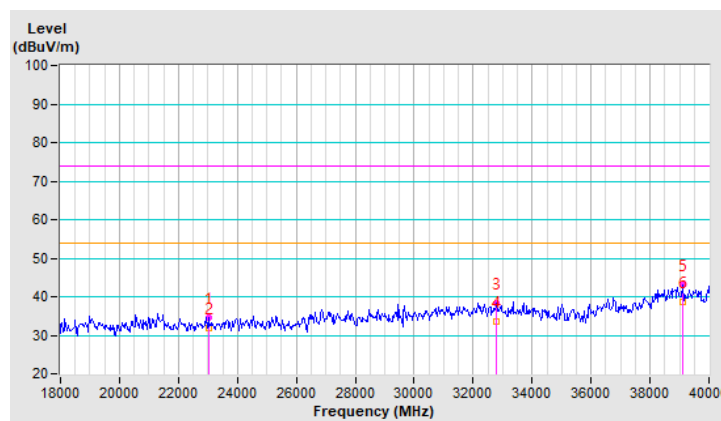
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:

Test value at 3-meter distance (dBuV)

= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)

= Test value at 1 meter distance (dBuV) -9.54(dB).

\*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



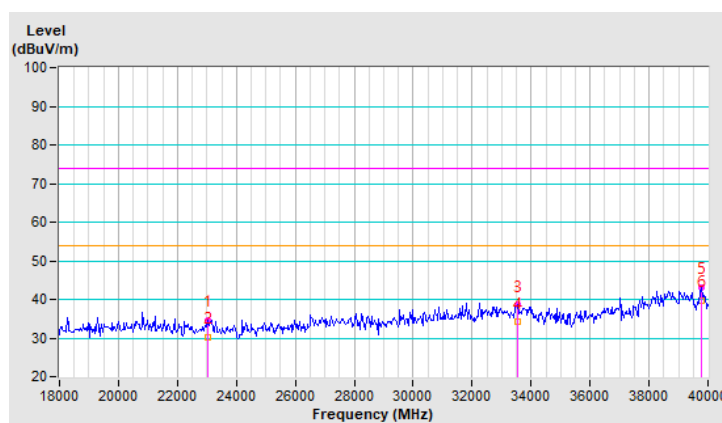
|                 |               |                   |                           |
|-----------------|---------------|-------------------|---------------------------|
| Frequency Range | 18GHz ~ 40GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|---------------|-------------------|---------------------------|

| Antenna Polarity: Vertical |             |                         |                |             |                    |                      |                  |                          |
|----------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.                        | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1                          | 23016.00    | 34.6 PK                 | 74.0           | -39.4       | 1.47 V             | 251                  | 47.2             | -12.6                    |
| 2                          | 23016.00    | 30.2 AV                 | 54.0           | -23.8       | 1.47 V             | 251                  | 42.8             | -12.6                    |
| 3                          | 33554.00    | 38.5 PK                 | 74.0           | -35.5       | 1.46 V             | 249                  | 49.5             | -11.0                    |
| 4                          | 33554.00    | 34.1 AV                 | 54.0           | -19.9       | 1.46 V             | 249                  | 45.1             | -11.0                    |
| 5                          | 39758.00    | 43.2 PK                 | 74.0           | -30.8       | 1.49 V             | 179                  | 46.4             | -3.2                     |
| 6                          | 39758.00    | 39.7 AV                 | 54.0           | -14.3       | 1.49 V             | 179                  | 42.9             | -3.2                     |

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:  
 Test value at 3-meter distance (dBuV)  
 = Test value at 1 meter distance (dBuV) -20log(3/1)(dB)  
 = Test value at 1 meter distance (dBuV) -9.54(dB).

\*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



### For above 40GHz

|                 |                |                   |              |
|-----------------|----------------|-------------------|--------------|
| Frequency Range | 40GHz ~ 200GHz | Detector Function | Average (AV) |
|-----------------|----------------|-------------------|--------------|

| Antenna Polarity: Horizontal |                 |                      |                     |                             |                                     |                                           |                              |
|------------------------------|-----------------|----------------------|---------------------|-----------------------------|-------------------------------------|-------------------------------------------|------------------------------|
| NO.                          | Frequency (GHz) | EIRP Level (dBm/MHz) | Raw Value (dBm/MHz) | Receiver Antenna Gain (dBi) | Power Density (pW/cm <sup>2</sup> ) | Power Density Limit (pW/cm <sup>2</sup> ) | Margin (pW/cm <sup>2</sup> ) |
| 1                            | 49.999          | -77.528              | 24.0                | -41.128                     | 0.068                               | 90                                        | -89.932                      |
| 2                            | 51.248          | -91.440              | 23.3                | -54.125                     | 0.003                               | 90                                        | -89.997                      |
| 3                            | 73.499          | -92.094              | 23.3                | -51.647                     | 0.006                               | 90                                        | -89.994                      |
| 4                            | 77.103          | -90.699              | 23.3                | -49.836                     | 0.009                               | 90                                        | -89.991                      |
| 5                            | 159.811         | -92.050              | 23.3                | -44.857                     | 0.029                               | 90                                        | -89.971                      |
| 6                            | 170.000         | -90.018              | 23.3                | -42.288                     | 0.052                               | 90                                        | -89.948                      |
| Antenna Polarity: Vertical   |                 |                      |                     |                             |                                     |                                           |                              |
| NO.                          | Frequency (GHz) | EIRP Level (dBm/MHz) | Raw Value (dBm/MHz) | Receiver Antenna Gain (dBi) | Power Density (pW/cm <sup>2</sup> ) | Power Density Limit (pW/cm <sup>2</sup> ) | Margin (pW/cm <sup>2</sup> ) |
| 1                            | 50.000          | -78.239              | 24.0                | -41.838                     | 0.058                               | 90                                        | -89.942                      |
| 2                            | 51.249          | -91.444              | 23.3                | -54.129                     | 0.003                               | 90                                        | -89.997                      |
| 3                            | 73.491          | -92.090              | 23.3                | -51.644                     | 0.006                               | 90                                        | -89.994                      |
| 4                            | 77.098          | -90.696              | 23.3                | -49.834                     | 0.009                               | 90                                        | -89.991                      |
| 5                            | 159.827         | -93.072              | 23.3                | -45.878                     | 0.023                               | 90                                        | -89.977                      |
| 6                            | 170.005         | -90.084              | 23.3                | -42.354                     | 0.051                               | 90                                        | -89.949                      |

#### Note:

1. The measured power level is converted to EIRP using the equation:

$$\text{EIRP} = \text{Raw Value} - \text{Receiver Antenna Gain} + 20 \cdot \log(4 \cdot 3.1416 \cdot D / \lambda)$$

where:

D is the measurement distance

$\lambda$  is the wavelength

\*Measurements made at 0.5 meter distance.

2. Power density formula as follows:

$$\text{Power density} = \text{EIRP} / (4 \cdot \pi \cdot r^2)$$

r is the standard distance at 3 meter

3. The far-field boundary is given in ANSI 63.10 as:

$$R \text{ far field} = (2 \cdot L^2) / \lambda$$

L is the Largest Antenna Dimension of measurement antenna, including the reflector

$\lambda$  is the wavelength

#### Q-Band

| Frequency (GHz) | L (m) | Lambda (m) | R (Far Field) (m) |
|-----------------|-------|------------|-------------------|
| 40              | 0.03  | 0.0075     | 0.240             |
| 50              | 0.03  | 0.0060     | 0.300             |

#### V-Band

| Frequency (GHz) | L (m) | Lambda (m) | R (Far Field) (m) |
|-----------------|-------|------------|-------------------|
| 50              | 0.025 | 0.0075     | 0.208             |
| 75              | 0.025 | 0.0040     | 0.313             |

#### W-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 75               | 0.018 | 0.0040     | 0.162             |
| 110              | 0.018 | 0.0027     | 0.238             |

#### D-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 110              | 0.012 | 0.0027     | 0.106             |
| 170              | 0.012 | 0.0018     | 0.163             |

#### Y-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 170              | 0.008 | 0.0018     | 0.073             |
| 260              | 0.008 | 0.0012     | 0.111             |

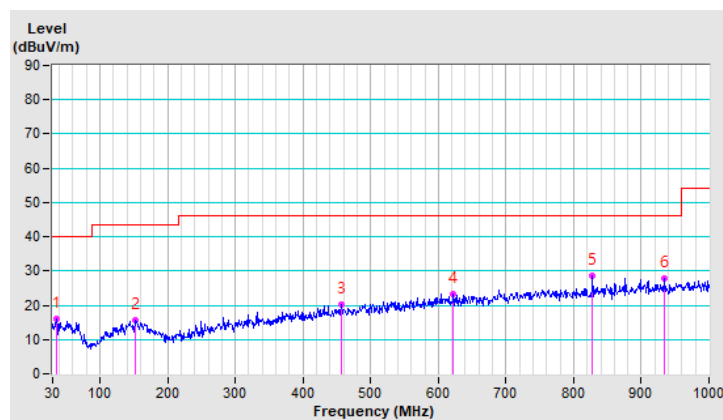
### For below 1GHz

|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |
|-----------------|-------------|-------------------|-----------------|

| Antenna Polarity & Test Distance : Horizontal at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|------------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                   | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                    | 34.85           | 16.0 QP                 | 40.0           | -24.0       | 1.02 H             | 300                  | 29.3             | -13.3                    |
| 2                                                    | 153.00          | 15.6 QP                 | 43.5           | -27.9       | 1.50 H             | 200                  | 28.1             | -12.5                    |
| 3                                                    | 457.55          | 20.3 QP                 | 46.0           | -25.7       | 1.04 H             | 100                  | 28.3             | -8.0                     |
| 4                                                    | 622.60          | 23.4 QP                 | 46.0           | -22.6       | 1.00 H             | 200                  | 28.0             | -4.6                     |
| 5                                                    | 828.06          | 28.6 QP                 | 46.0           | -17.4       | 1.04 H             | 222                  | 30.4             | -1.8                     |
| 6                                                    | 934.96          | 27.8 QP                 | 46.0           | -18.2       | 1.00 H             | 2                    | 28.2             | -0.4                     |

### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

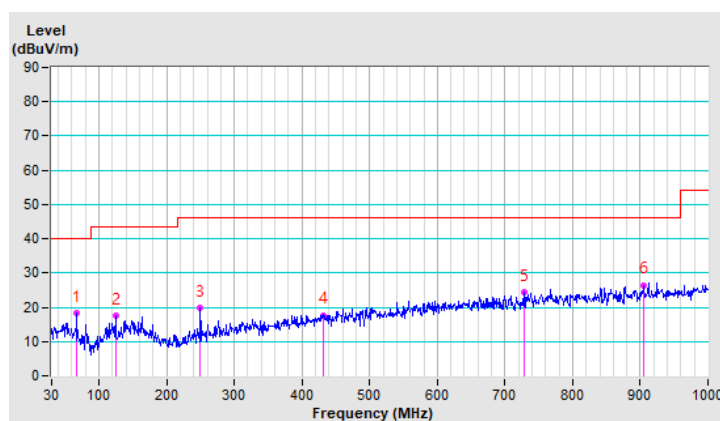


|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |
|-----------------|-------------|-------------------|-----------------|

| Antenna Polarity & Test Distance : Vertical at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                 | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                  | 66.38           | 18.4 QP                 | 40.0           | -21.6       | 1.45 V             | 122                  | 32.4             | -14.0                    |
| 2                                                  | 124.97          | 17.5 QP                 | 43.5           | -26.0       | 1.56 V             | 211                  | 31.8             | -14.3                    |
| 3                                                  | 250.01          | 19.7 QP                 | 46.0           | -26.3       | 1.00 V             | 360                  | 33.5             | -13.8                    |
| 4                                                  | 431.50          | 17.7 QP                 | 46.0           | -28.3       | 1.02 V             | 122                  | 26.3             | -8.6                     |
| 5                                                  | 727.85          | 24.5 QP                 | 46.0           | -21.5       | 1.00 V             | 360                  | 27.8             | -3.3                     |
| 6                                                  | 905.86          | 26.5 QP                 | 46.0           | -19.5       | 1.02 V             | 322                  | 27.6             | -1.1                     |

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



#### 4.1.8 Test Results (Mode 2)

Above 1GHz Data:

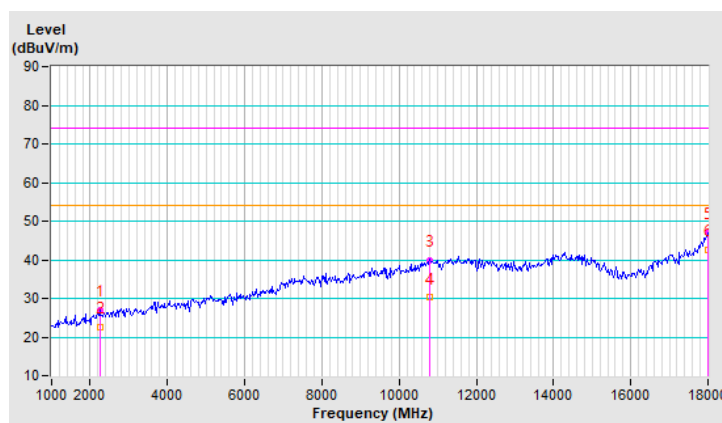
For 1~18GHz

|                 |              |                   |                           |
|-----------------|--------------|-------------------|---------------------------|
| Frequency Range | 1GHz ~ 18GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|--------------|-------------------|---------------------------|

| Antenna Polarity & Test Distance : Horizontal at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|------------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                   | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                    | 2241.00         | 26.9 PK                 | 74.0           | -47.1       | 1.41 H             | 11                   | 29.5             | -2.6                     |
| 2                                                    | 2241.00         | 22.6 AV                 | 54.0           | -31.4       | 1.41 H             | 11                   | 25.2             | -2.6                     |
| 3                                                    | 10792.00        | 40.0 PK                 | 74.0           | -34.0       | 1.20 H             | 212                  | 27.7             | 12.3                     |
| 4                                                    | 10792.00        | 30.2 AV                 | 54.0           | -23.8       | 1.20 H             | 212                  | 17.9             | 12.3                     |
| 5                                                    | 17983.00        | 47.0 PK                 | 74.0           | -27.0       | 1.57 H             | 217                  | 22.1             | 24.9                     |
| 6                                                    | 17983.00        | 42.7 AV                 | 54.0           | -11.3       | 1.57 H             | 217                  | 17.8             | 24.9                     |

#### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.





# For 18~40GHz

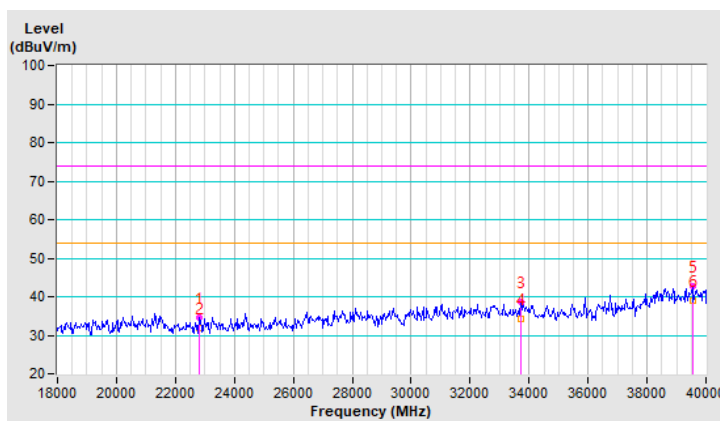
|                 |               |                   |                           |
|-----------------|---------------|-------------------|---------------------------|
| Frequency Range | 18GHz ~ 40GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|---------------|-------------------|---------------------------|

| Antenna Polarity: Horizontal |             |                         |                |             |                    |                      |                  |                          |
|------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.                          | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1                            | 22796.00    | 34.6 PK                 | 74.0           | -39.4       | 1.47 H             | 258                  | 47.5             | -12.9                    |
| 2                            | 22796.00    | 31.9 AV                 | 54.0           | -22.1       | 1.47 H             | 258                  | 44.8             | -12.9                    |
| 3                            | 33708.00    | 38.8 PK                 | 74.0           | -35.2       | 1.49 H             | 147                  | 49.6             | -10.8                    |
| 4                            | 33708.00    | 34.3 AV                 | 54.0           | -19.7       | 1.49 H             | 147                  | 45.1             | -10.8                    |
| 5                            | 39538.00    | 42.8 PK                 | 74.0           | -31.2       | 1.52 H             | 357                  | 46.6             | -3.8                     |
| 6                            | 39538.00    | 38.9 AV                 | 54.0           | -15.1       | 1.52 H             | 357                  | 42.7             | -3.8                     |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:  
Test value at 3-meter distance (dBuV)  
= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)  
= Test value at 1 meter distance (dBuV) -9.54(dB).

\*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



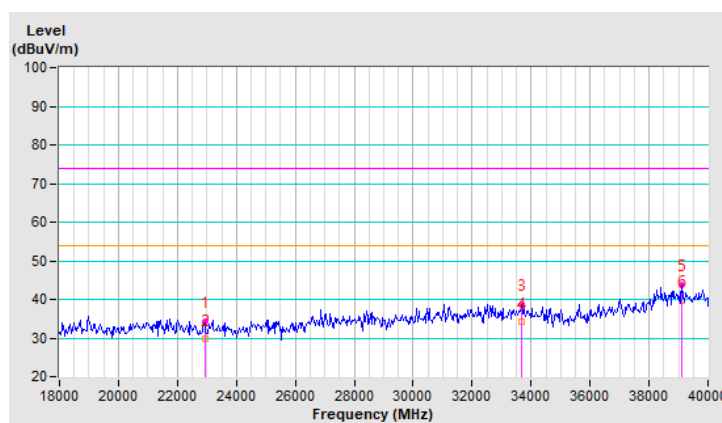
|                 |               |                   |                           |
|-----------------|---------------|-------------------|---------------------------|
| Frequency Range | 18GHz ~ 40GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|---------------|-------------------|---------------------------|

| Antenna Polarity: Vertical |             |                         |                |             |                    |                      |                  |                          |
|----------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.                        | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1                          | 22928.00    | 34.2 PK                 | 74.0           | -39.8       | 1.52 V             | 256                  | 47.0             | -12.8                    |
| 2                          | 22928.00    | 29.7 AV                 | 54.0           | -24.3       | 1.52 V             | 256                  | 42.5             | -12.8                    |
| 3                          | 33686.00    | 38.6 PK                 | 74.0           | -35.4       | 1.56 V             | 255                  | 49.4             | -10.8                    |
| 4                          | 33686.00    | 34.1 AV                 | 54.0           | -19.9       | 1.56 V             | 255                  | 44.9             | -10.8                    |
| 5                          | 39120.00    | 43.8 PK                 | 74.0           | -30.2       | 1.55 V             | 179                  | 47.9             | -4.1                     |
| 6                          | 39120.00    | 39.7 AV                 | 54.0           | -14.3       | 1.55 V             | 179                  | 43.8             | -4.1                     |

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:  
Test value at 3-meter distance (dBuV)  
= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)  
= Test value at 1 meter distance (dBuV) -9.54(dB).

\*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



### For above 40GHz

|                 |                |                   |              |
|-----------------|----------------|-------------------|--------------|
| Frequency Range | 40GHz ~ 200GHz | Detector Function | Average (AV) |
|-----------------|----------------|-------------------|--------------|

| Antenna Polarity: Horizontal |                 |                      |                     |                             |                                     |                                           |                              |
|------------------------------|-----------------|----------------------|---------------------|-----------------------------|-------------------------------------|-------------------------------------------|------------------------------|
| NO.                          | Frequency (GHz) | EIRP Level (dBm/MHz) | Raw Value (dBm/MHz) | Receiver Antenna Gain (dBi) | Power Density (pW/cm <sup>2</sup> ) | Power Density Limit (pW/cm <sup>2</sup> ) | Margin (pW/cm <sup>2</sup> ) |
| 1                            | 50.000          | -41.128              | -77.528             | 24.0                        | 0.068                               | 90                                        | -89.932                      |
| 2                            | 51.249          | -54.128              | -91.440             | 23.3                        | 0.003                               | 90                                        | -89.997                      |
| 3                            | 73.677          | -50.713              | -92.094             | 23.3                        | 0.008                               | 90                                        | -89.992                      |
| 4                            | 77.099          | -49.816              | -90.699             | 23.3                        | 0.009                               | 90                                        | -89.991                      |
| 5                            | 159.800         | -45.870              | -92.050             | 23.3                        | 0.023                               | 90                                        | -89.977                      |
| 6                            | 170.396         | -42.640              | -90.018             | 23.3                        | 0.048                               | 90                                        | -89.952                      |
| Antenna Polarity: Vertical   |                 |                      |                     |                             |                                     |                                           |                              |
| NO.                          | Frequency (GHz) | EIRP Level (dBm/MHz) | Raw Value (dBm/MHz) | Receiver Antenna Gain (dBi) | Power Density (pW/cm <sup>2</sup> ) | Power Density Limit (pW/cm <sup>2</sup> ) | Margin (pW/cm <sup>2</sup> ) |
| 1                            | 49.968          | -41.838              | -78.239             | 24.0                        | 0.058                               | 90                                        | -89.942                      |
| 2                            | 51.250          | -54.122              | -91.444             | 23.3                        | 0.003                               | 90                                        | -89.997                      |
| 3                            | 73.502          | -50.663              | -92.090             | 23.3                        | 0.008                               | 90                                        | -89.992                      |
| 4                            | 77.104          | -49.816              | -90.696             | 23.3                        | 0.009                               | 90                                        | -89.991                      |
| 5                            | 159.795         | -45.924              | -93.072             | 23.3                        | 0.023                               | 90                                        | -89.977                      |
| 6                            | 170.000         | -42.337              | -90.084             | 23.3                        | 0.052                               | 90                                        | -89.948                      |

#### Note:

1. The measured power level is converted to EIRP using the equation:

$$\text{EIRP} = \text{Raw Value} - \text{Receiver Antenna Gain} + 20 \cdot \log(4 \cdot 3.1416 \cdot D / \lambda)$$

where:

D is the measurement distance

$\lambda$  is the wavelength

\*Measurements made at 0.5 meter distance.

2. Power density formula as follows:

$$\text{Power density} = \text{EIRP} / (4 \cdot \pi \cdot r^2)$$

r is the standard distance at 3 meter

3. The far-field boundary is given in ANSI 63.10 as:

$$R \text{ far field} = (2 \cdot L^2) / \lambda$$

L is the Largest Antenna Dimension of measurement antenna, including the reflector

$\lambda$  is the wavelength

#### Q-Band

| Frequency (GHz) | L (m) | Lambda (m) | R (Far Field) (m) |
|-----------------|-------|------------|-------------------|
| 40              | 0.03  | 0.0075     | 0.240             |
| 50              | 0.03  | 0.0060     | 0.300             |

#### V-Band

| Frequency (GHz) | L (m) | Lambda (m) | R (Far Field) (m) |
|-----------------|-------|------------|-------------------|
| 50              | 0.025 | 0.0075     | 0.208             |
| 75              | 0.025 | 0.0040     | 0.313             |

#### W-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 75               | 0.018 | 0.0040     | 0.162             |
| 110              | 0.018 | 0.0027     | 0.238             |

#### D-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 110              | 0.012 | 0.0027     | 0.106             |
| 170              | 0.012 | 0.0018     | 0.163             |

#### Y-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 170              | 0.008 | 0.0018     | 0.073             |
| 260              | 0.008 | 0.0012     | 0.111             |

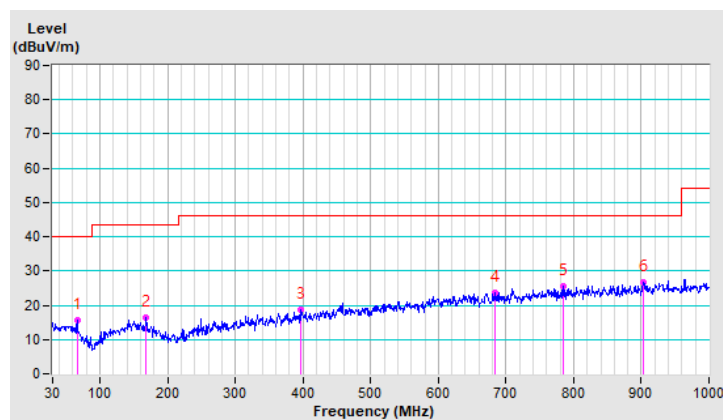
### For below 1GHz

|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |
|-----------------|-------------|-------------------|-----------------|

| Antenna Polarity & Test Distance : Horizontal at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|------------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                   | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                    | 66.38           | 15.5 QP                 | 40.0           | -24.5       | 1.06 H             | 200                  | 29.5             | -14.0                    |
| 2                                                    | 168.18          | 16.5 QP                 | 43.5           | -27.0       | 1.00 H             | 200                  | 29.5             | -13.0                    |
| 3                                                    | 397.60          | 18.7 QP                 | 46.0           | -27.3       | 1.05 H             | 200                  | 28.4             | -9.7                     |
| 4                                                    | 684.59          | 23.5 QP                 | 46.0           | -22.5       | 2.00 H             | 155                  | 27.2             | -3.7                     |
| 5                                                    | 784.36          | 25.5 QP                 | 46.0           | -20.5       | 1.03 H             | 200                  | 27.8             | -2.3                     |
| 6                                                    | 902.36          | 26.8 QP                 | 46.0           | -19.2       | 1.00 H             | 200                  | 27.8             | -1.0                     |

### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

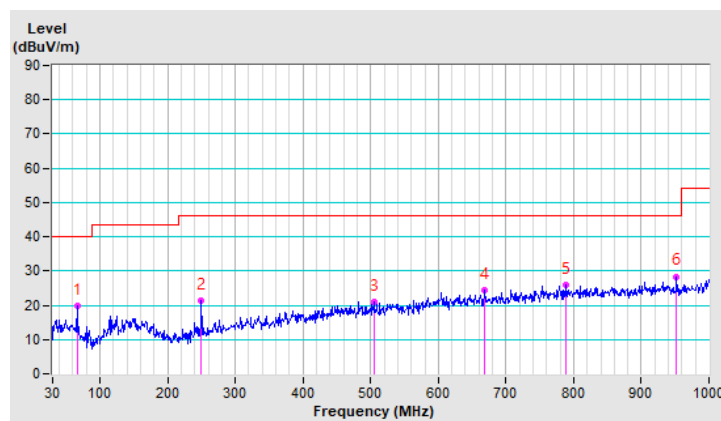


|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |
|-----------------|-------------|-------------------|-----------------|

| Antenna Polarity & Test Distance : Vertical at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                 | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                  | 66.62           | 19.7 QP                 | 40.0           | -20.3       | 1.00 V             | 200                  | 33.6             | -13.9                    |
| 2                                                  | 250.01          | 21.3 QP                 | 46.0           | -24.7       | 1.03 V             | 200                  | 35.1             | -13.8                    |
| 3                                                  | 504.35          | 20.9 QP                 | 46.0           | -25.1       | 1.50 V             | 200                  | 28.2             | -7.3                     |
| 4                                                  | 668.92          | 24.4 QP                 | 46.0           | -21.6       | 1.10 V             | 200                  | 28.5             | -4.1                     |
| 5                                                  | 788.34          | 25.8 QP                 | 46.0           | -20.2       | 1.50 V             | 200                  | 28.1             | -2.3                     |
| 6                                                  | 952.08          | 28.4 QP                 | 46.0           | -17.6       | 2.00 V             | 100                  | 28.8             | -0.4                     |

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



#### 4.1.9 Test Results (Mode 3)

Above 1GHz Data:

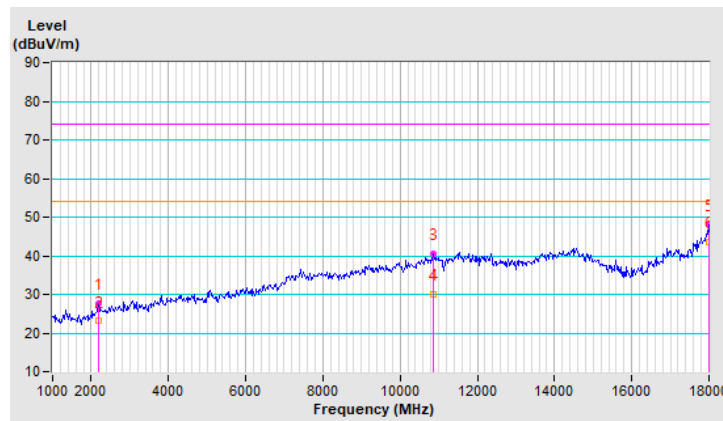
For 1~18GHz

|                 |              |                   |                           |
|-----------------|--------------|-------------------|---------------------------|
| Frequency Range | 1GHz ~ 18GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|--------------|-------------------|---------------------------|

| Antenna Polarity & Test Distance : Horizontal at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|------------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                   | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                    | 2173.00         | 27.6 PK                 | 74.0           | -46.4       | 1.47 H             | 11                   | 30.6             | -3.0                     |
| 2                                                    | 2173.00         | 23.1 AV                 | 54.0           | -30.9       | 1.47 H             | 11                   | 26.1             | -3.0                     |
| 3                                                    | 10860.00        | 40.5 PK                 | 74.0           | -33.5       | 1.26 H             | 214                  | 28.2             | 12.3                     |
| 4                                                    | 10860.00        | 30.1 AV                 | 54.0           | -23.9       | 1.26 H             | 214                  | 17.8             | 12.3                     |
| 5                                                    | 17983.00        | 48.0 PK                 | 74.0           | -26.0       | 1.54 H             | 208                  | 23.1             | 24.9                     |
| 6                                                    | 17983.00        | 43.7 AV                 | 54.0           | -10.3       | 1.54 H             | 208                  | 18.8             | 24.9                     |

#### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.

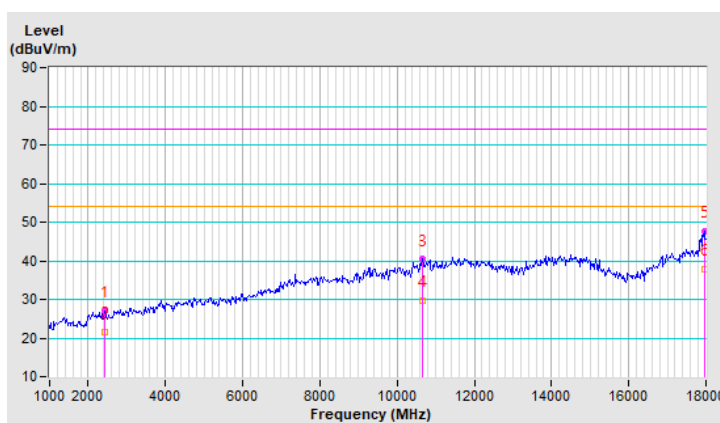


|                 |              |                   |                           |
|-----------------|--------------|-------------------|---------------------------|
| Frequency Range | 1GHz ~ 18GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|--------------|-------------------|---------------------------|

| Antenna Polarity & Test Distance : Vertical at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                 | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                  | 2411.00         | 27.0 PK                 | 74.0           | -47.0       | 1.67 V             | 125                  | 30.2             | -3.2                     |
| 2                                                  | 2411.00         | 21.5 AV                 | 54.0           | -32.5       | 1.67 V             | 125                  | 24.7             | -3.2                     |
| 3                                                  | 10639.00        | 40.4 PK                 | 74.0           | -33.6       | 2.97 V             | 125                  | 28.9             | 11.5                     |
| 4                                                  | 10639.00        | 29.7 AV                 | 54.0           | -24.3       | 2.97 V             | 125                  | 18.2             | 11.5                     |
| 5                                                  | 17949.00        | 47.6 PK                 | 74.0           | -26.4       | 1.54 V             | 126                  | 23.4             | 24.2                     |
| 6                                                  | 17949.00        | 37.8 AV                 | 54.0           | -16.2       | 1.54 V             | 126                  | 13.6             | 24.2                     |

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.



# For 18~40GHz

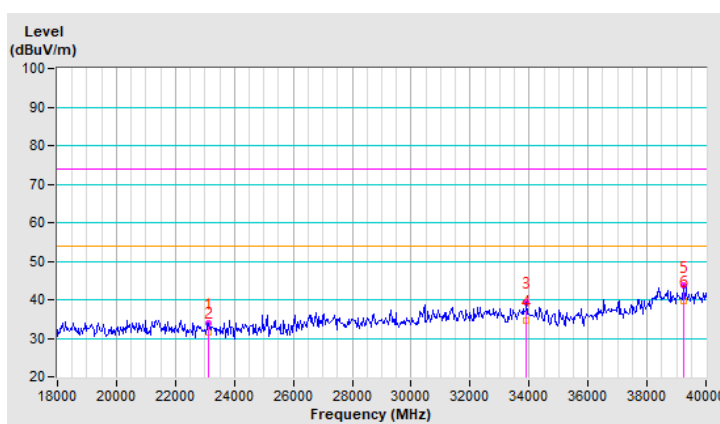
|                 |               |                   |                           |
|-----------------|---------------|-------------------|---------------------------|
| Frequency Range | 18GHz ~ 40GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|---------------|-------------------|---------------------------|

| Antenna Polarity: Horizontal |             |                         |                |             |                    |                      |                  |                          |
|------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.                          | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1                            | 23104.00    | 33.9 PK                 | 74.0           | -40.1       | 1.45 H             | 261                  | 46.5             | -12.6                    |
| 2                            | 23104.00    | 31.5 AV                 | 54.0           | -22.5       | 1.45 H             | 261                  | 44.1             | -12.6                    |
| 3                            | 33906.00    | 39.4 PK                 | 74.0           | -34.6       | 1.51 H             | 150                  | 50.0             | -10.6                    |
| 4                            | 33906.00    | 34.7 AV                 | 54.0           | -19.3       | 1.51 H             | 150                  | 45.3             | -10.6                    |
| 5                            | 39252.00    | 43.6 PK                 | 74.0           | -30.4       | 1.49 H             | 355                  | 47.5             | -3.9                     |
| 6                            | 39252.00    | 39.6 AV                 | 54.0           | -14.4       | 1.49 H             | 355                  | 43.5             | -3.9                     |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:  
Test value at 3-meter distance (dBuV)  
= Test value at 1 meter distance (dBuV) -20log(3/1)(dB)  
= Test value at 1 meter distance (dBuV) -9.54(dB).

\*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



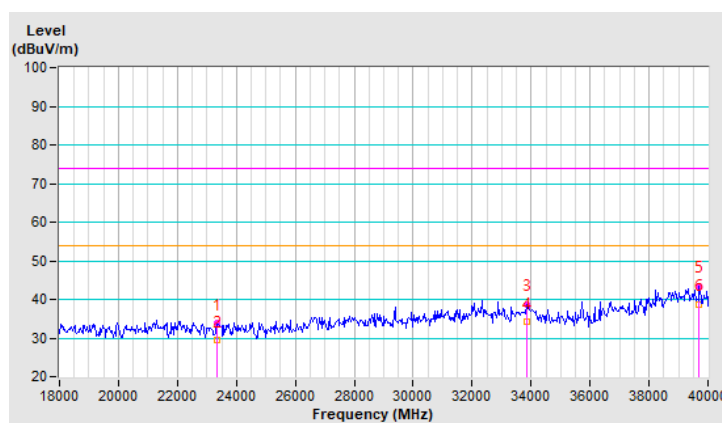
|                 |               |                   |                           |
|-----------------|---------------|-------------------|---------------------------|
| Frequency Range | 18GHz ~ 40GHz | Detector Function | Peak (PK)<br>Average (AV) |
|-----------------|---------------|-------------------|---------------------------|

| Antenna Polarity: Vertical |             |                         |                |             |                    |                      |                  |                          |
|----------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.                        | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1                          | 23346.00    | 33.8 PK                 | 74.0           | -40.2       | 1.51 V             | 257                  | 46.3             | -12.5                    |
| 2                          | 23346.00    | 29.4 AV                 | 54.0           | -24.6       | 1.51 V             | 257                  | 41.9             | -12.5                    |
| 3                          | 33840.00    | 38.6 PK                 | 74.0           | -35.4       | 1.57 V             | 240                  | 49.1             | -10.5                    |
| 4                          | 33840.00    | 34.1 AV                 | 54.0           | -19.9       | 1.57 V             | 240                  | 44.6             | -10.5                    |
| 5                          | 39692.00    | 43.5 PK                 | 74.0           | -30.5       | 1.52 V             | 178                  | 46.7             | -3.2                     |
| 6                          | 39692.00    | 38.8 AV                 | 54.0           | -15.2       | 1.52 V             | 178                  | 42.0             | -3.2                     |

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. Shorter measurement distances was used to improve the measurement system's noise floor. As standard description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was extrapolate results to the 3-m distance:  
 Test value at 3-meter distance (dBuV)  
 = Test value at 1 meter distance (dBuV) -20log(3/1)(dB)  
 = Test value at 1 meter distance (dBuV) -9.54(dB).

\*Measurements made at 1 meter distance. Test value converted to account for 3-meter measurement distance.



### For above 40GHz

|                 |                |                   |              |
|-----------------|----------------|-------------------|--------------|
| Frequency Range | 40GHz ~ 200GHz | Detector Function | Average (AV) |
|-----------------|----------------|-------------------|--------------|

| Antenna Polarity: Horizontal |                 |                      |                     |                             |                                     |                                           |                              |
|------------------------------|-----------------|----------------------|---------------------|-----------------------------|-------------------------------------|-------------------------------------------|------------------------------|
| NO.                          | Frequency (GHz) | EIRP Level (dBm/MHz) | Raw Value (dBm/MHz) | Receiver Antenna Gain (dBi) | Power Density (pW/cm <sup>2</sup> ) | Power Density Limit (pW/cm <sup>2</sup> ) | Margin (pW/cm <sup>2</sup> ) |
| 1                            | 49.999          | -41.128              | -77.529             | 24.0                        | 0.068                               | 90                                        | -89.932                      |
| 2                            | 51.247          | -54.127              | -91.443             | 23.3                        | 0.003                               | 90                                        | -89.997                      |
| 3                            | 73.502          | -51.598              | -91.181             | 23.3                        | 0.006                               | 90                                        | -89.994                      |
| 4                            | 77.091          | -49.827              | -90.678             | 23.3                        | 0.009                               | 90                                        | -89.991                      |
| 5                            | 159.816         | -45.781              | -93.063             | 23.3                        | 0.023                               | 90                                        | -89.977                      |
| 6                            | 170.014         | -42.532              | -90.390             | 23.3                        | 0.049                               | 90                                        | -89.951                      |
| Antenna Polarity: Vertical   |                 |                      |                     |                             |                                     |                                           |                              |
| NO.                          | Frequency (GHz) | EIRP Level (dBm/MHz) | Raw Value (dBm/MHz) | Receiver Antenna Gain (dBi) | Power Density (pW/cm <sup>2</sup> ) | Power Density Limit (pW/cm <sup>2</sup> ) | Margin (pW/cm <sup>2</sup> ) |
| 1                            | 50.000          | -41.838              | -78.233             | 24.0                        | 0.058                               | 90                                        | -89.942                      |
| 2                            | 51.250          | -54.130              | -91.437             | 23.3                        | 0.003                               | 90                                        | -89.997                      |
| 3                            | 73.495          | -51.640              | -91.110             | 23.3                        | 0.006                               | 90                                        | -89.994                      |
| 4                            | 77.106          | -49.806              | -90.679             | 23.3                        | 0.009                               | 90                                        | -89.991                      |
| 5                            | 159.812         | -45.868              | -93.116             | 23.3                        | 0.023                               | 90                                        | -89.977                      |
| 6                            | 170.008         | -42.308              | -90.067             | 23.3                        | 0.052                               | 90                                        | -89.948                      |

#### Note:

1. The measured power level is converted to EIRP using the equation:

$$\text{EIRP} = \text{Raw Value} - \text{Receiver Antenna Gain} + 20 \cdot \log(4 \cdot 3.1416 \cdot D / \lambda)$$

where:

D is the measurement distance

$\lambda$  is the wavelength

\*Measurements made at 0.5 meter distance.

2. Power density formula as follows:

$$\text{Power density} = \text{EIRP} / (4 \cdot \pi \cdot r^2)$$

r is the standard distance at 3 meter

3. The far-field boundary is given in ANSI 63.10 as:

$$R \text{ far field} = (2 \cdot L^2) / \lambda$$

L is the Largest Antenna Dimension of measurement antenna, including the reflector

$\lambda$  is the wavelength

#### Q-Band

| Frequency (GHz) | L (m) | Lambda (m) | R (Far Field) (m) |
|-----------------|-------|------------|-------------------|
| 40              | 0.03  | 0.0075     | 0.240             |
| 50              | 0.03  | 0.0060     | 0.300             |

#### V-Band

| Frequency (GHz) | L (m) | Lambda (m) | R (Far Field) (m) |
|-----------------|-------|------------|-------------------|
| 50              | 0.025 | 0.0075     | 0.208             |
| 75              | 0.025 | 0.0040     | 0.313             |

#### W-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 75               | 0.018 | 0.0040     | 0.162             |
| 110              | 0.018 | 0.0027     | 0.238             |

#### D-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 110              | 0.012 | 0.0027     | 0.106             |
| 170              | 0.012 | 0.0018     | 0.163             |

#### Y-Band

| Frequency (GHz ) | L (m) | Lambda (m) | R (Far Field) (m) |
|------------------|-------|------------|-------------------|
| 170              | 0.008 | 0.0018     | 0.073             |
| 260              | 0.008 | 0.0012     | 0.111             |

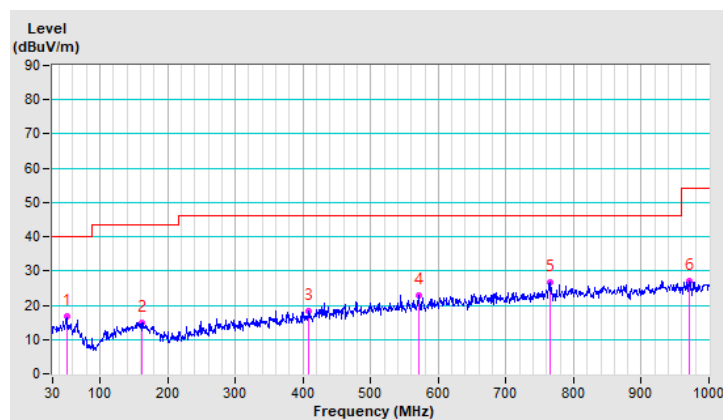
### For below 1GHz

|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |
|-----------------|-------------|-------------------|-----------------|

| Antenna Polarity & Test Distance : Horizontal at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|------------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                   | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                    | 50.76           | 16.6 QP                 | 40.0           | -23.4       | 1.00 H             | 200                  | 29.1             | -12.5                    |
| 2                                                    | 161.64          | 15.0 QP                 | 43.5           | -28.5       | 1.50 H             | 200                  | 27.6             | -12.6                    |
| 3                                                    | 408.66          | 18.4 QP                 | 46.0           | -27.6       | 1.00 H             | 11                   | 27.9             | -9.5                     |
| 4                                                    | 571.00          | 22.7 QP                 | 46.0           | -23.3       | 1.06 H             | 200                  | 28.6             | -5.9                     |
| 5                                                    | 765.35          | 26.8 QP                 | 46.0           | -19.2       | 1.05 H             | 20                   | 29.1             | -2.3                     |
| 6                                                    | 971.04          | 27.2 QP                 | 54.0           | -26.8       | 1.10 H             | 2                    | 27.3             | -0.1                     |

### Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

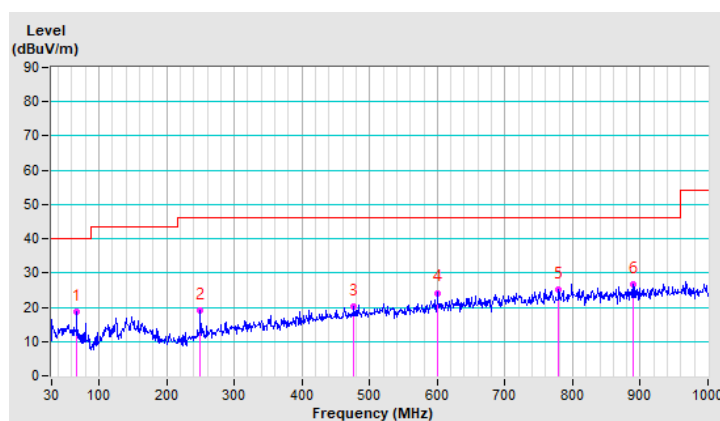


|                 |             |                   |                 |
|-----------------|-------------|-------------------|-----------------|
| Frequency Range | 9kHz ~ 1GHz | Detector Function | Quasi-Peak (QP) |
|-----------------|-------------|-------------------|-----------------|

| Antenna Polarity & Test Distance : Vertical at 3 m |                 |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------|-----------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No                                                 | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                  | 66.62           | 18.7 QP                 | 40.0           | -21.3       | 1.10 V             | 200                  | 32.6             | -13.9                    |
| 2                                                  | 250.01          | 19.2 QP                 | 46.0           | -26.8       | 1.03 V             | 200                  | 33.0             | -13.8                    |
| 3                                                  | 476.32          | 20.1 QP                 | 46.0           | -25.9       | 2.00 V             | 102                  | 27.8             | -7.7                     |
| 4                                                  | 601.26          | 24.2 QP                 | 46.0           | -21.8       | 1.03 V             | 200                  | 29.0             | -4.8                     |
| 5                                                  | 778.93          | 25.3 QP                 | 46.0           | -20.7       | 1.00 V             | 102                  | 27.5             | -2.2                     |
| 6                                                  | 890.29          | 26.7 QP                 | 46.0           | -19.3       | 1.05 V             | 200                  | 27.9             | -1.2                     |

**Remarks:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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The address and road map of all our labs can be found in our web site also.

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