

## FCC Test Report (Sub-GHz)

### (Spot Check)

**Report No.:** RF180830E03F-5

**FCC ID:** 2APLE18300398

**Original FCC ID:** 2APLE18300394

**Test Model:** VMB5000

**Revision:** Rev 5

**Received Date:** May 15, 2019

**Test Date:** May 20 to 27, 2019

**Issued Date:** June 12, 2019

**Applicant:** Arlo Technologies, Inc.

**Address:** 2200 Faraday Ave. Suite 150, Carlsbad, CA 92008, United States

**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 R.O.C.

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

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



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### Release Control Record

| Issue No.      | Description       | Date Issued   |
|----------------|-------------------|---------------|
| RF180830E03F-5 | Original release. | June 12, 2019 |

## 1 Certificate of Conformity

**Product:** Alro Gen5 Entry Hub

**Brand:** Arlo

**Test Model:** VMB5000

**Revision:** Rev 5

**Sample Status:** Pre Production Unit

**Applicant:** Arlo Technologies, Inc.

**Test Date:** May 20 to 27, 2019

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
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** Wendy Wu , **Date:** June 12, 2019  
Wendy Wu / Specialist

**Approved by :** May Chen , **Date:** June 12, 2019  
May Chen / Manager

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (Section 15.247) |                                              |        |                                                                                     |
|------------------------------------------------|----------------------------------------------|--------|-------------------------------------------------------------------------------------|
| FCC Clause                                     | Test Item                                    | Result | Remarks                                                                             |
| 15.207                                         | AC Power Conducted Emission                  | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -10.93dB at 0.46641MHz. |
| 15.205 /<br>15.209 /<br>15.247(d)              | Radiated Emissions and Band Edge Measurement | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -6.7dB at 64.53MHz.     |
| 15.247(b)                                      | Conducted power                              | PASS   | Meet the requirement of limit.                                                      |

### 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 (k=2) ( $\pm$ ) |
|------------------------------------|----------------|--------------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 1.8 dB                               |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 1GHz   | 5.1 dB                               |
| Radiated Emissions above 1 GHz     | 1GHz ~ 6GHz    | 5.1 dB                               |
|                                    | 6GHz ~ 18GHz   | 5.0 dB                               |
|                                    | 18GHz ~ 40GHz  | 5.2 dB                               |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT (Sub-GHz)

|                       |                          |
|-----------------------|--------------------------|
| Product               | Alro Gen5 Entry Hub      |
| Brand                 | Arlo                     |
| Test Model            | VMB5000                  |
| Revision              | Rev 5                    |
| S/N                   | 5GH2917EA29A4            |
| Status of EUT         | Pre Production Unit      |
| Power Supply Rating   | 12Vdc from power adapter |
| Modulation Type       | O-QPSK                   |
| Modulation Technology | DSSS                     |
| Transfer Rate         | 100kbps                  |
| Operating Frequency   | 915MHz                   |
| Number of Channel     | 1                        |
| Output Power          | 90.573mW                 |
| Antenna Type          | Refer to Note            |
| Antenna Connector     | Refer to Note            |
| Accessory Device      | Adapter x1               |
| Data Cable Supplied   | NA                       |

Note:

- Exhibit prepared for FCC Spot Check Verification report, the format, test items and amount of spot-check test data are decided by applicant's engineering judgment, for more details please refer to declaration letter exhibit.
- There are WLAN, Z-Wave, Zigbee and Sub-GHz technology used for the EUT. The EUT has below radios as following table:

| Radio 1                 | Radio 2 | Radio 3 | Radio 4 |
|-------------------------|---------|---------|---------|
| WLAN (2.4GHz+5GHz band) | Z-Wave  | Zigbee  | Sub-GHz |

#### 3. Simultaneously transmission condition.

| Condition | Technology  |           |        |        |         |
|-----------|-------------|-----------|--------|--------|---------|
| 1         | WLAN 2.4GHz | WLAN 5GHz | Z-Wave | Zigbee | Sub-GHz |

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

4. The EUT must be supplied with a power adapter and following different models could be chosen as following table:

| No. | Brand | Model No.     | Spec.                                                                                          |
|-----|-------|---------------|------------------------------------------------------------------------------------------------|
| 1   | Arlo  | AD2076F10     | Input: 100-120Vac, 0.56A, 50/60Hz<br>Output: 12Vdc, 1.5A<br>DC output cable (Unshielded, 1.8m) |
| 2   | Arlo  | AD2067M20     | Input: 100-240Vac, 1.0A, 50/60Hz<br>Output: 12Vdc, 2.5A<br>DC output cable (Unshielded, 1.8m)  |
| 3   | Arlo  | 2ABB018F 1 NJ | Input: 100-120Vac, 0.6A, 50/60Hz<br>Output: 12Vdc, 1.5A<br>DC output cable (Unshielded, 1.8m)  |
| 4   | Arlo  | P030WM1251    | Input: 100-240Vac, 1.0A, 50/60Hz<br>Output: 12Vdc, 2.5A<br>DC output cable (Unshielded, 1.8m)  |

Note: From the above models, the worst radiated emission and AC power conducted emission test was found in **Adapter 2**. Therefore only the test data of the modes were recorded in this report.

5. The antennas provided to the EUT, please refer to the following table:

| Sub-GHz |                            |                  |                        |                      |              |                |                   |
|---------|----------------------------|------------------|------------------------|----------------------|--------------|----------------|-------------------|
| Ant No. | Brand                      | Model            | Antenna Gain (dBi)     | Frequency rang (MHz) | Antenna type | Connector type |                   |
| 1       | NA                         | 902P00214N0      | 1.5                    | 860~930              | PIFA         | NA             |                   |
| Z-Wave  |                            |                  |                        |                      |              |                |                   |
| Ant No. | Brand                      | Model            | Antenna Gain (dBi)     | Frequency rang (MHz) | Antenna type | Connector type |                   |
| 1       | NA                         | 902P00213N0      | 2.5                    | 860~930              | PIFA         | NA             |                   |
| Zigbee  |                            |                  |                        |                      |              |                |                   |
| Ant No. | Brand                      | Model            | Antenna Gain (dBi)     | Frequency rang (GHz) | Antenna type | Connector type |                   |
| 1       | INPAQ TECHNOLOGY CO., LTD. | ACA-5036-A2-CC-S | 3.5                    | 2.4~2.4835           | CHIP         | NA             |                   |
| WLAN    |                            |                  |                        |                      |              |                |                   |
| Ant No. | Brand                      | Model            | Antenna Net Gain (dBi) | Frequency rang (GHz) | Antenna type | Connector type | Cable Length (mm) |
| 1       | NA                         | 9 07X01052X0     | 2.5                    | 2.4~2.4835           | Dipole       | i-plex         | 75                |
|         |                            |                  | 1.8                    | 5.15~5.25            |              |                |                   |
|         |                            |                  | 2                      | 5.25~5.35            |              |                |                   |
|         |                            |                  | 2.2                    | 5.47~5.725           |              |                |                   |
|         |                            |                  | 1.6                    | 5.725~5.85           |              |                |                   |
| 2       | NA                         | 9 07X00747X19    | 2.5                    | 2.4~2.4835           | Dipole       | i-plex         | 90                |
|         |                            |                  | 2.2                    | 5.15~5.25            |              |                |                   |
|         |                            |                  | 1.2                    | 5.25~5.35            |              |                |                   |
|         |                            |                  | 3.2                    | 5.47~5.725           |              |                |                   |
|         |                            |                  | 3.5                    | 5.725~5.85           |              |                |                   |

6. 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.

### 3.2 Description of Test Modes

1 channel is provided to this EUT:

| Channel | Frequency (MHz) |
|---------|-----------------|
| 1       | 915             |

#### 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO |       |     |      | DESCRIPTION |
|--------------------|---------------|-------|-----|------|-------------|
|                    | RE $\geq$ 1G  | RE<1G | PLC | APCM |             |
| -                  | √             | √     | √   | √    | -           |

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

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

**PLC:** Power Line Conducted Emission

**APCM:** Antenna Port Conducted Measurement

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

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (kbps) |
|-------------------|----------------|-----------------------|-----------------|------------------|
| 1                 | 1              | DSSS                  | O-QPSK          | 100              |

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

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (kbps) |
|-------------------|----------------|-----------------------|-----------------|------------------|
| 1                 | 1              | DSSS                  | O-QPSK          | 100              |

#### Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (kbps) |
|-------------------|----------------|-----------------------|-----------------|------------------|
| 1                 | 1              | DSSS                  | O-QPSK          | 100              |

### Antenna Port Conducted Measurement:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

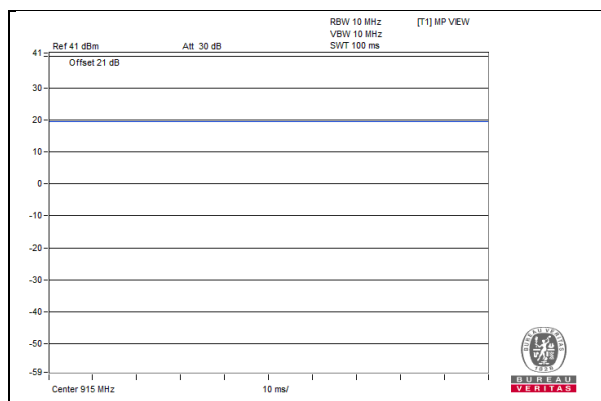
| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (kbps) |
|-------------------|----------------|-----------------------|-----------------|------------------|
| 1                 | 1              | DSSS                  | O-QPSK          | 100              |

### Test Condition:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER  | TESTED BY    |
|---------------|--------------------------|--------------|--------------|
| RE $\geq$ 1G  | 22deg. C, 67%RH          | 120Vac, 60Hz | Rey Chen     |
| RE<1G         | 25deg. C, 65%RH          | 120Vac, 60Hz | Robert Cheng |
|               | 23deg. C, 68%RH          |              | Ryan Du      |
| PLC           | 25deg. C, 75%RH          | 120Vac, 60Hz | Andy Ho      |
| APCM          | 25deg. C, 60%RH          | 120Vac, 60Hz | Nelson Teng  |

### 3.3 Duty Cycle of Test Signal

Duty cycle of test signal is 100 %, duty factor is not required.



### 3.4 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.

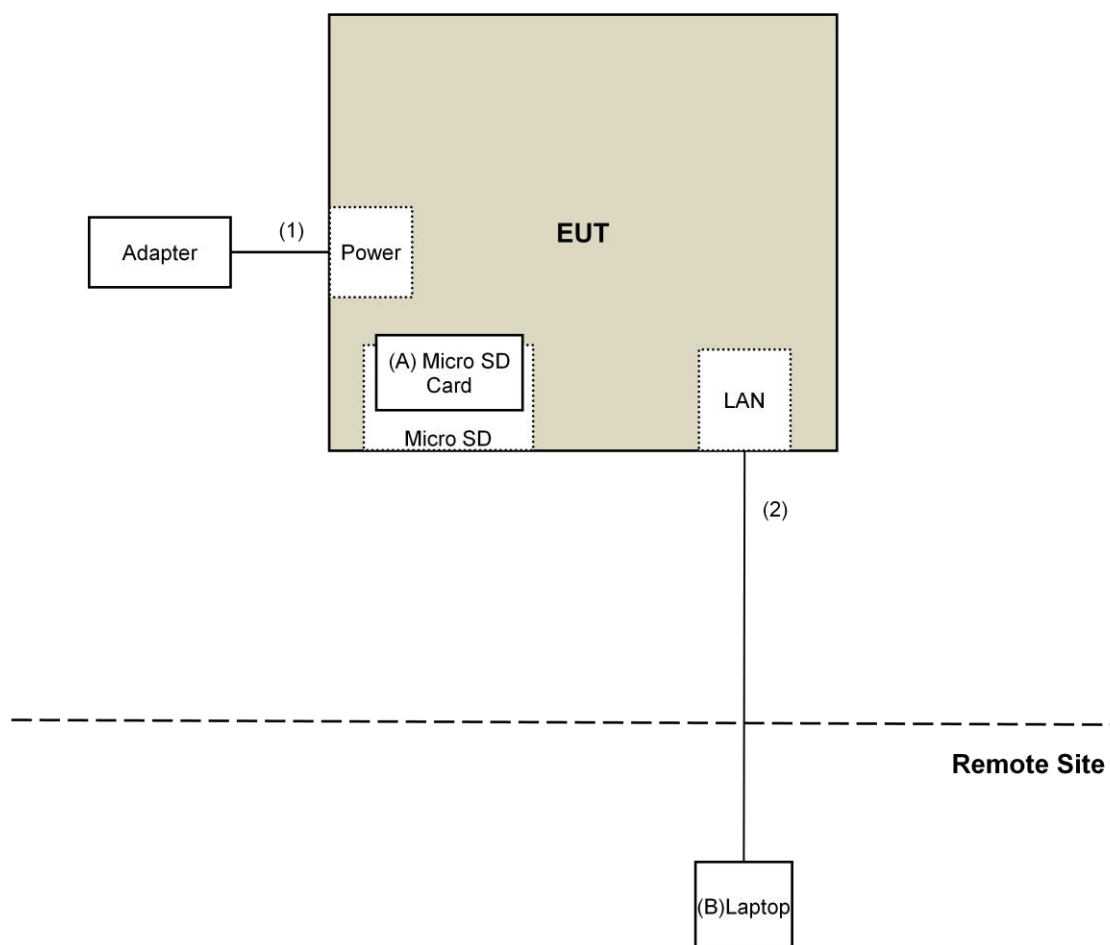
| ID | Product      | Brand   | Model No. | Serial No. | FCC ID  | Remarks         |
|----|--------------|---------|-----------|------------|---------|-----------------|
| A. | MicroSD Card | SanDisk | 8GB       | NA         | NA      | Provided by Lab |
| B. | Laptop       | DELL    | E6420     | B92T3R1    | FCC DoC | Provided by Lab |

Note:

1. All power cords of the above support units are non-shielded (1.8m).

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks            |
|----|--------------|------|------------|--------------------|--------------|--------------------|
| 1. | DC Cable     | 1    | 1.8        | No                 | 0            | Supplied by client |
| 2. | RJ-45 Cable  | 1    | 10         | No                 | 0            | Provided by Lab    |

### 3.4.1 Configuration of System under Test



### 3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C (15.247)**

**KDB 558074 D01 15.247 Meas Guidance v05r02**

**ANSI C63.10-2013**

All test items have been performed and recorded as per the above standards.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

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

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

| 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.

#### 4.1.2 Test Instruments

| DESCRIPTION & MANUFACTURER              | MODEL NO.            | SERIAL NO.  | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------------|----------------------|-------------|-----------------|------------------|
| Test Receiver<br>Agilent                | N9038A               | MY50010156  | July 12, 2018   | July 11, 2019    |
| Pre-Amplifier<br>EMCI                   | EMC001340            | 980142      | Jan. 25, 2019   | Jan. 24, 2020    |
| Loop Antenna<br>Electro-Metrics         | EM-6879              | 269         | Sep. 07, 2018   | Sep. 06, 2019    |
| RF Cable                                | NA                   | LOOPCAB-001 | Jan. 14, 2019   | Jan. 13, 2020    |
| RF Cable                                | NA                   | LOOPCAB-002 | Jan. 14, 2019   | Jan. 13, 2020    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2B         | AMP-ZFL-05  | Apr. 30, 2019   | Apr. 29, 2020    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168            | 9168-361    | Nov. 22, 2018   | Nov. 21, 2019    |
| RF Cable                                | 8D                   | 966-3-1     | Mar. 18, 2019   | Mar. 17, 2020    |
| RF Cable                                | 8D                   | 966-3-2     | Mar. 18, 2019   | Mar. 17, 2020    |
| RF Cable                                | 8D                   | 966-3-3     | Mar. 18, 2019   | Mar. 17, 2020    |
| Fixed attenuator<br>Mini-Circuits       | UNAT-5+              | PAD-3m-3-01 | Sep. 27, 2018   | Sep. 26, 2019    |
| Horn Antenna<br>SCHWARZBECK             | BBHA9120-D           | 9120D-406   | Nov. 25, 2018   | Nov. 24, 2019    |
| Pre-Amplifier<br>EMCI                   | EMC12630SE           | 980384      | Jan. 28, 2019   | Jan. 27, 2020    |
| RF Cable                                | EMC104-SM-SM-1200    | 160922      | Jan. 28, 2019   | Jan. 27, 2020    |
| RF Cable                                | EMC104-SM-SM-2000    | 180601      | June 12, 2018   | June 11, 2019    |
| RF Cable                                | EMC104-SM-SM-6000    | 180602      | June 12, 2018   | June 11, 2019    |
| Spectrum Analyzer<br>Keysight           | N9030A               | MY54490679  | July 23, 2018   | July 22, 2019    |
| Pre-Amplifier<br>EMCI                   | EMC184045SE          | 980387      | Jan. 28, 2019   | Jan. 27, 2020    |
| Horn Antenna<br>SCHWARZBECK             | BBHA 9170            | BBHA9170519 | Nov. 25, 2018   | Nov. 24, 2019    |
| RF Cable                                | EMC102-KM-KM-1200    | 160924      | Jan. 28, 2019   | Jan. 27, 2020    |
| RF Cable                                | EMC102-KM-KM-1200    | 160925      | Jan. 28, 2019   | Jan. 27, 2020    |
| Software                                | ADT_Radiated_V8.7.08 | NA          | NA              | NA               |
| Antenna Tower & Turn Table<br>Max-Full  | MF-7802              | MF780208406 | NA              | NA               |
| Boresight Antenna Fixture               | FBA-01               | FBA-SIP01   | NA              | NA               |
| Spectrum Analyzer<br>R&S                | FSV40                | 100964      | June 20, 2018   | June 19, 2019    |
| Power meter<br>Anritsu                  | ML2495A              | 1014008     | May 13, 2019    | May 12, 2020     |
| Power sensor<br>Anritsu                 | MA2411B              | 0917122     | May 13, 2019    | May 12, 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 test was performed in 966 Chamber No. 3.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: May 20 to 27, 2019

#### 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**

- 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 detects 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:**

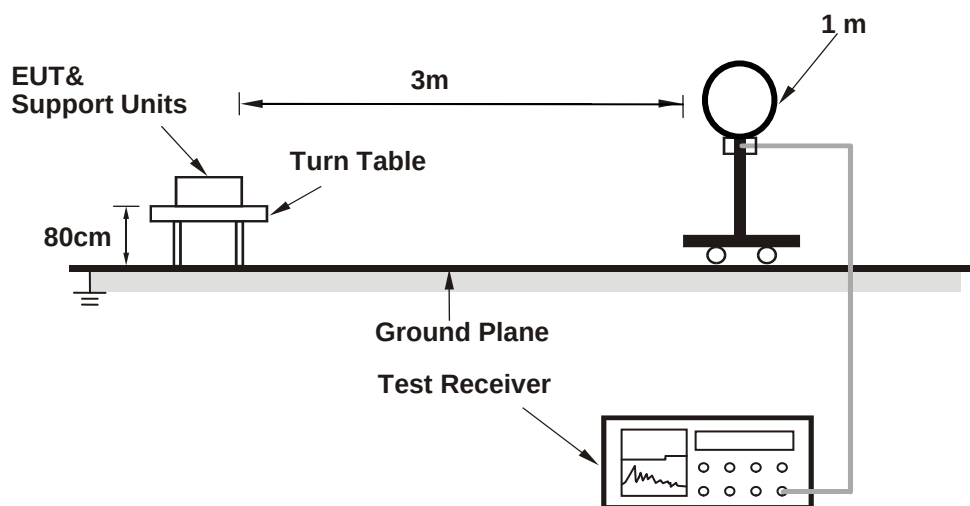
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

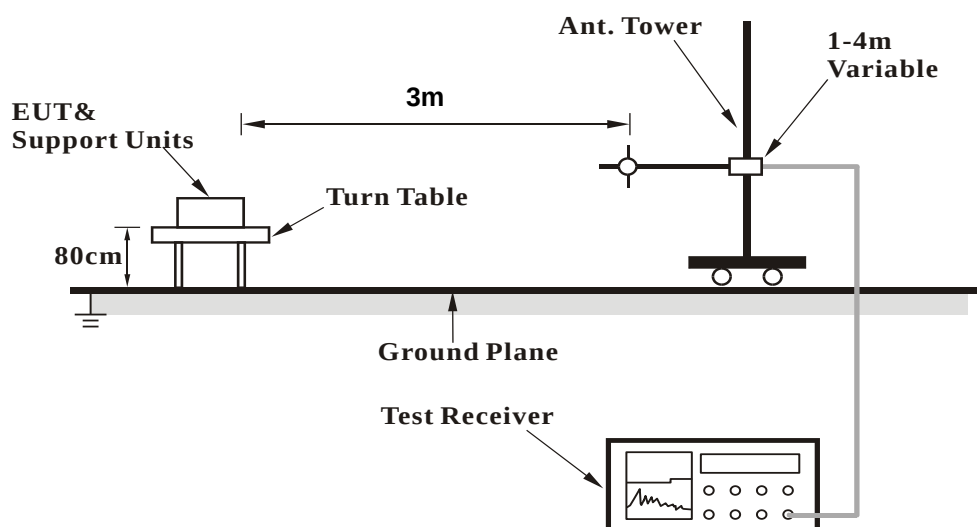
No deviation.

#### 4.1.5 Test Setup

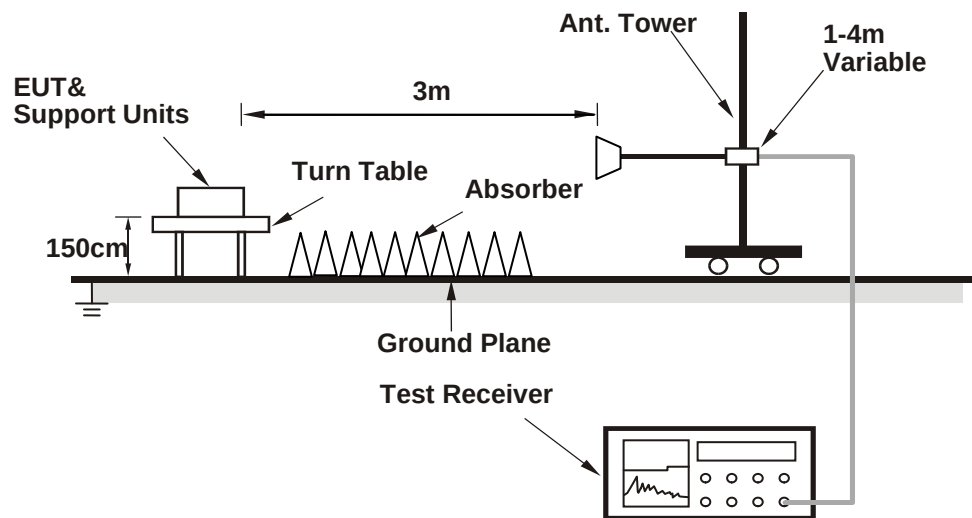
##### For Radiated emission below 30MHz



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



### For Radiated emission above 1GHz



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

#### 4.1.6 EUT Operating Conditions

- Connected the EUT with the Laptop which is placed on remote site.
- Controlling software (Run teraturn paste TX command) has been activated to set the EUT on specific status.

#### 4.1.7 Test Results

##### Above 1GHz Data:

|                        |              |                              |              |
|------------------------|--------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 1 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 10GHz |                              | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2745.00        | 41.7 PK                       | 74.0              | -32.3          | 1.54 H                   | 201                        | 43.3                   | -1.6                           |
| 2                                                   | 2745.00        | 37.3 AV                       | 54.0              | -16.7          | 1.54 H                   | 201                        | 38.9                   | -1.6                           |
| 3                                                   | 3660.00        | 48.9 PK                       | 74.0              | -25.1          | 1.53 H                   | 21                         | 49.1                   | -0.2                           |
| 4                                                   | 3660.00        | 47.0 AV                       | 54.0              | -7.0           | 1.53 H                   | 21                         | 47.2                   | -0.2                           |
| 5                                                   | 4575.00        | 38.2 PK                       | 74.0              | -35.8          | 1.61 H                   | 59                         | 36.5                   | 1.7                            |
| 6                                                   | 4575.00        | 25.2 AV                       | 54.0              | -28.8          | 1.61 H                   | 59                         | 23.5                   | 1.7                            |
| 7                                                   | 7320.00        | 43.8 PK                       | 74.0              | -30.2          | 1.53 H                   | 100                        | 35.8                   | 8.0                            |
| 8                                                   | 7320.00        | 31.0 AV                       | 54.0              | -23.0          | 1.53 H                   | 100                        | 23.0                   | 8.0                            |
| 9                                                   | 8235.00        | 49.2 PK                       | 74.0              | -24.8          | 1.48 H                   | 355                        | 40.6                   | 8.6                            |
| 10                                                  | 8235.00        | 41.8 AV                       | 54.0              | -12.2          | 1.48 H                   | 355                        | 33.2                   | 8.6                            |
| 11                                                  | 9150.00        | 45.5 PK                       | 74.0              | -28.5          | 1.47 H                   | 360                        | 35.6                   | 9.9                            |
| 12                                                  | 9150.00        | 35.0 AV                       | 54.0              | -19.0          | 1.47 H                   | 360                        | 25.1                   | 9.9                            |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2745.00        | 38.8 PK                       | 74.0              | -35.2          | 1.38 V                   | 90                         | 40.4                   | -1.6                           |
| 2                                                   | 2745.00        | 31.4 AV                       | 54.0              | -22.6          | 1.38 V                   | 90                         | 33.0                   | -1.6                           |
| 3                                                   | 3660.00        | 47.8 PK                       | 74.0              | -26.2          | 1.48 V                   | 89                         | 48.0                   | -0.2                           |
| 4                                                   | 3660.00        | 45.6 AV                       | 54.0              | -8.4           | 1.48 V                   | 89                         | 45.8                   | -0.2                           |
| 5                                                   | 4575.00        | 38.0 PK                       | 74.0              | -36.0          | 1.53 V                   | 73                         | 36.3                   | 1.7                            |
| 6                                                   | 4575.00        | 25.2 AV                       | 54.0              | -28.8          | 1.53 V                   | 73                         | 23.5                   | 1.7                            |
| 7                                                   | 7320.00        | 43.9 PK                       | 74.0              | -30.1          | 1.55 V                   | 77                         | 35.9                   | 8.0                            |
| 8                                                   | 7320.00        | 31.1 AV                       | 54.0              | -22.9          | 1.55 V                   | 77                         | 23.1                   | 8.0                            |
| 9                                                   | 8235.00        | 48.9 PK                       | 74.0              | -25.1          | 1.00 V                   | 13                         | 40.3                   | 8.6                            |
| 10                                                  | 8235.00        | 41.6 AV                       | 54.0              | -12.4          | 1.00 V                   | 13                         | 33.0                   | 8.6                            |
| 11                                                  | 9150.00        | 45.2 PK                       | 74.0              | -28.8          | 2.00 V                   | 31                         | 35.3                   | 9.9                            |
| 12                                                  | 9150.00        | 35.4 AV                       | 54.0              | -18.6          | 2.00 V                   | 31                         | 25.5                   | 9.9                            |

#### 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

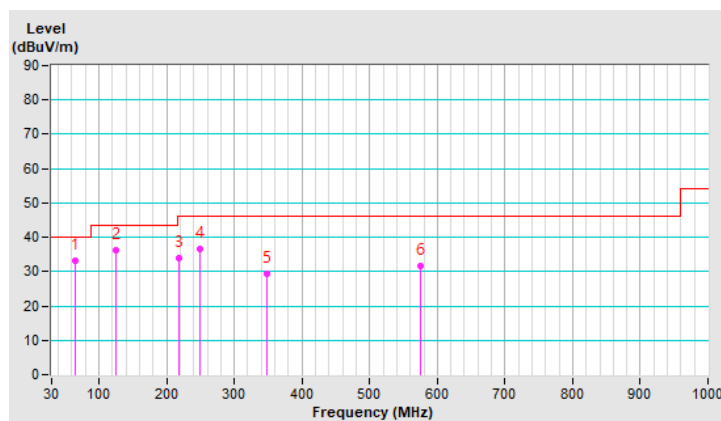
# Below 1GHz Data:

|                 |              |                      |                 |
|-----------------|--------------|----------------------|-----------------|
| CHANNEL         | TX Channel 1 | DETECTOR<br>FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 9kHz ~ 1GHz  |                      |                 |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 64.53          | 33.3 QP                       | 40.0              | -6.7           | 1.00 H                   | 153                        | 47.9                   | -14.6                          |
| 2                                                   | 125.25         | 36.3 QP                       | 43.5              | -7.2           | 3.55 H                   | 224                        | 51.0                   | -14.7                          |
| 3                                                   | 217.73         | 33.9 QP                       | 46.0              | -12.1          | 1.50 H                   | 200                        | 49.0                   | -15.1                          |
| 4                                                   | 249.99         | 36.5 QP                       | 46.0              | -9.5           | 2.60 H                   | 321                        | 50.0                   | -13.5                          |
| 5                                                   | 348.51         | 29.3 QP                       | 46.0              | -16.7          | 1.53 H                   | 264                        | 40.0                   | -10.7                          |
| 6                                                   | 575.02         | 31.8 QP                       | 46.0              | -14.2          | 2.05 H                   | 250                        | 37.1                   | -5.3                           |

## 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.

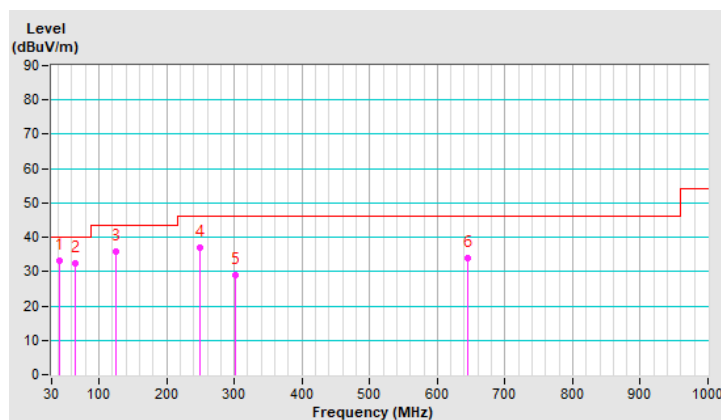


|                        |              |                              |                 |
|------------------------|--------------|------------------------------|-----------------|
| <b>CHANNEL</b>         | TX Channel 1 | <b>DETECTOR<br/>FUNCTION</b> | Quasi-Peak (QP) |
| <b>FREQUENCY RANGE</b> | 9kHz ~ 1GHz  |                              |                 |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                               | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                 | 41.81          | 33.2 QP                       | 40.0              | -6.8           | 1.00 V                   | 129                        | 47.3                   | -14.1                          |
| 2                                                 | 65.27          | 32.5 QP                       | 40.0              | -7.5           | 3.09 V                   | 220                        | 47.2                   | -14.7                          |
| 3                                                 | 124.96         | 35.9 QP                       | 43.5              | -7.6           | 1.51 V                   | 189                        | 50.6                   | -14.7                          |
| 4                                                 | 249.86         | 36.9 QP                       | 46.0              | -9.1           | 1.52 V                   | 235                        | 50.4                   | -13.5                          |
| 5                                                 | 301.86         | 28.9 QP                       | 46.0              | -17.1          | 2.53 V                   | 300                        | 40.7                   | -11.8                          |
| 6                                                 | 644.25         | 34.0 QP                       | 46.0              | -12.0          | 1.01 V                   | 188                        | 37.6                   | -3.6                           |

#### 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.

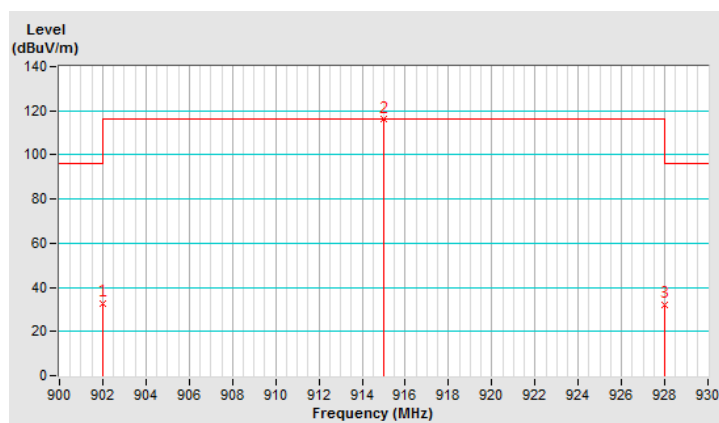


|                        |                 |                          |                 |
|------------------------|-----------------|--------------------------|-----------------|
| <b>CHANNEL</b>         | TX Channel 1    | <b>DETECTOR FUNCTION</b> | Quasi-Peak (QP) |
| <b>FREQUENCY RANGE</b> | 900MHz ~ 930MHz |                          |                 |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|-----------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 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                                                   | 902.00      | 32.8 QP                 | 96.3           | -63.5       | 1.63 H             | 186                  | 26.9             | 5.9                      |
| 2                                                   | *915.00     | 116.3 QP                |                |             | 1.63 H             | 186                  | 109.9            | 6.4                      |
| 3                                                   | 928.00      | 32.3 QP                 | 96.3           | -64.0       | 1.63 H             | 186                  | 25.7             | 6.6                      |

**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. " \* ": Fundamental frequency.

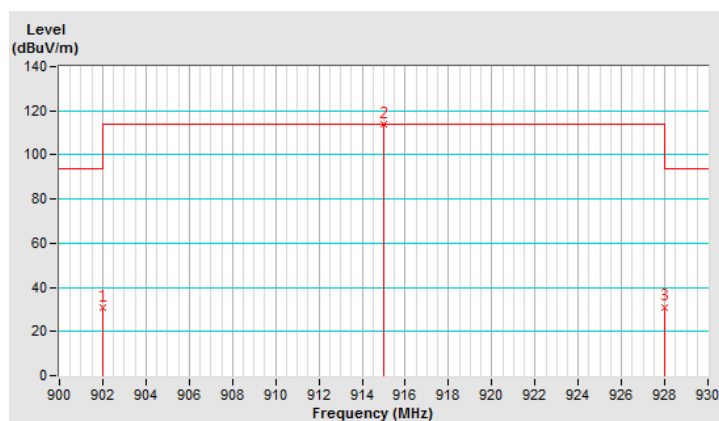


|                        |                 |                              |                 |
|------------------------|-----------------|------------------------------|-----------------|
| <b>CHANNEL</b>         | TX Channel 1    | <b>DETECTOR<br/>FUNCTION</b> | Quasi-Peak (QP) |
| <b>FREQUENCY RANGE</b> | 900MHz ~ 930MHz |                              |                 |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                               | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                 | 902.00         | 30.7 QP                       | 93.7              | -63.0          | 1.21 V                   | 302                        | 24.8                   | 5.9                            |
| 2                                                 | *915.02        | 113.7 QP                      |                   |                | 1.21 V                   | 302                        | 107.3                  | 6.4                            |
| 3                                                 | 928.00         | 31.0 QP                       | 93.7              | -62.7          | 1.21 V                   | 306                        | 24.4                   | 6.6                            |

**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. " \* ": Fundamental frequency.



## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

| Frequency (MHz) | Conducted Limit (dBuV) |         |
|-----------------|------------------------|---------|
|                 | Quasi-peak             | Average |
| 0.15 - 0.5      | 66 - 56                | 56 - 46 |
| 0.50 - 5.0      | 56                     | 46      |
| 5.0 - 30.0      | 60                     | 50      |

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

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

### 4.2.2 Test Instruments

| DESCRIPTION & MANUFACTURER                                | MODEL NO.           | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------------------------------|---------------------|------------|-----------------|------------------|
| Test Receiver R&S                                         | ESCS 30             | 847124/029 | Oct. 24, 2018   | Oct. 23, 2019    |
| Line-Impedance Stabilization Network (for EUT) R&S        | ESH3-Z5             | 848773/004 | Oct. 22, 2018   | Oct. 21, 2019    |
| Line-Impedance Stabilization Network (for Peripheral) R&S | ESH3-Z5             | 835239/001 | Mar. 17, 2019   | Mar. 16, 2020    |
| 50 ohms Terminator                                        | N/A                 | 3          | Oct. 22, 2018   | Oct. 21, 2019    |
| RF Cable                                                  | 5D-FB               | COCCAB-001 | Sep. 28, 2018   | Sep. 27, 2019    |
| Fixed attenuator EMCI                                     | STI02-2200-10       | 003        | Mar. 14, 2019   | Mar. 13, 2020    |
| Software BVADT                                            | BVADT_Cond_V7.3.7.4 | NA         | NA              | NA               |

#### Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
- 3 Tested Date: May 27, 2019

#### 4.2.3 Test Procedures

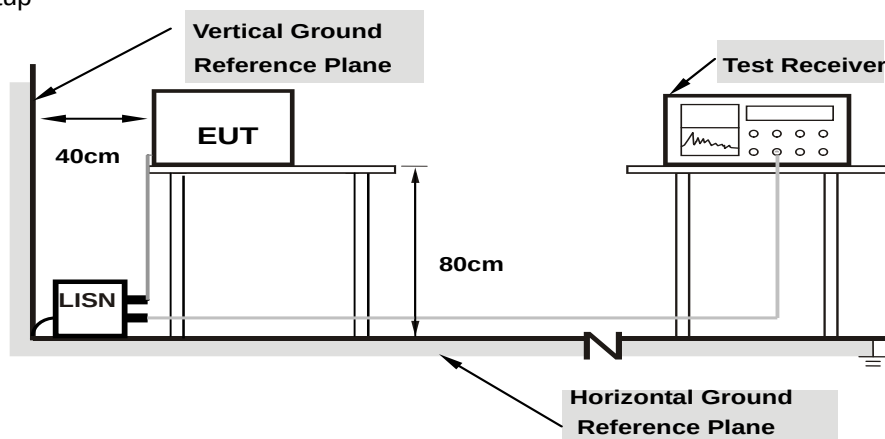
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

**Note:** The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



**Note:** 1.Support units were connected to second LISN.

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

#### 4.2.6 EUT Operating Conditions

Same as 4.1.6.

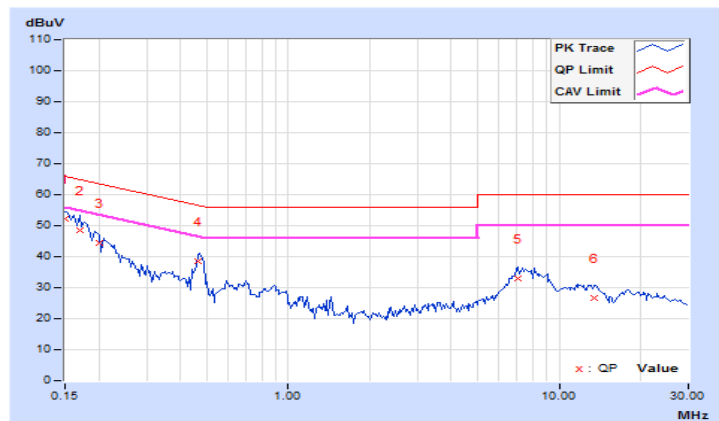
#### 4.2.7 Test Results

| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|----------|-------------------|--------------------------------|
|-------|----------|-------------------|--------------------------------|

| No | Freq.<br>[MHz] | Corr.<br>Factor | Reading Value<br>[dB (uV)] |       | Emission Level<br>[dB (uV)] |       | Limit<br>[dB (uV)] |       | Margin<br>(dB) |        |
|----|----------------|-----------------|----------------------------|-------|-----------------------------|-------|--------------------|-------|----------------|--------|
|    |                | (dB)            | Q.P.                       | AV.   | Q.P.                        | AV.   | Q.P.               | AV.   | Q.P.           | AV.    |
|    |                |                 |                            |       |                             |       |                    |       |                |        |
| 1  | 0.15000        | 10.03           | 42.24                      | 26.15 | 52.27                       | 36.18 | 66.00              | 56.00 | -13.73         | -19.82 |
| 2  | 0.16953        | 10.04           | 38.60                      | 21.07 | 48.64                       | 31.11 | 64.98              | 54.98 | -16.34         | -23.87 |
| 3  | 0.20078        | 10.05           | 34.30                      | 20.46 | 44.35                       | 30.51 | 63.58              | 53.58 | -19.23         | -23.07 |
| 4  | 0.46641        | 10.09           | 28.25                      | 23.75 | 38.34                       | 33.84 | 56.58              | 46.58 | -18.24         | -12.74 |
| 5  | 7.02734        | 10.51           | 22.44                      | 17.08 | 32.95                       | 27.59 | 60.00              | 50.00 | -27.05         | -22.41 |
| 6  | 13.46094       | 10.93           | 15.69                      | 9.96  | 26.62                       | 20.89 | 60.00              | 50.00 | -33.38         | -29.11 |

#### Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

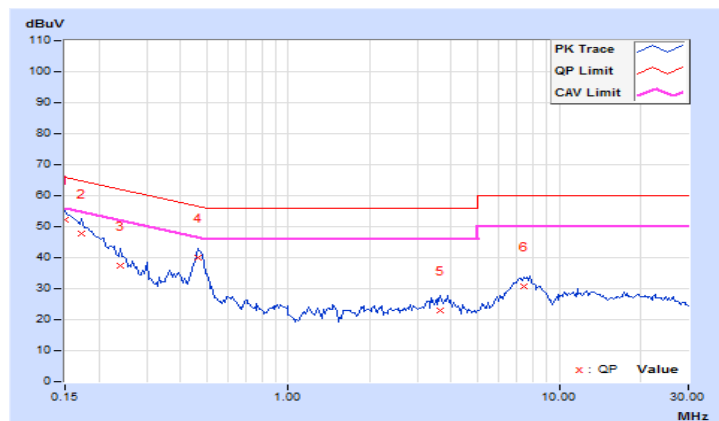


|       |             |                   |                                |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

| No       | Freq.<br>[MHz] | Corr.       | Reading Value |              | Emission Level |              | Limit        |              | Margin        |               |
|----------|----------------|-------------|---------------|--------------|----------------|--------------|--------------|--------------|---------------|---------------|
|          |                | Factor      | [dB (uV)]     |              | [dB (uV)]      |              | [dB (uV)]    |              | (dB)          |               |
|          |                | (dB)        | Q.P.          | AV.          | Q.P.           | AV.          | Q.P.         | AV.          | Q.P.          | AV.           |
| 1        | 0.15000        | 9.94        | 42.30         | 25.22        | 52.24          | 35.16        | 66.00        | 56.00        | -13.76        | -20.84        |
| 2        | 0.17344        | 9.94        | 38.00         | 22.76        | 47.94          | 32.70        | 64.79        | 54.79        | -16.85        | -22.09        |
| 3        | 0.23984        | 9.96        | 27.27         | 11.94        | 37.23          | 21.90        | 62.10        | 52.10        | -24.87        | -30.20        |
| <b>4</b> | <b>0.46641</b> | <b>9.98</b> | <b>29.90</b>  | <b>25.67</b> | <b>39.88</b>   | <b>35.65</b> | <b>56.58</b> | <b>46.58</b> | <b>-16.70</b> | <b>-10.93</b> |
| 5        | 3.62500        | 10.15       | 12.97         | 4.67         | 23.12          | 14.82        | 56.00        | 46.00        | -32.88        | -31.18        |
| 6        | 7.37500        | 10.37       | 20.50         | 15.24        | 30.87          | 25.61        | 60.00        | 50.00        | -29.13        | -24.39        |

#### Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

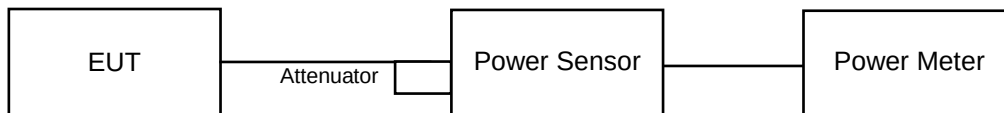


### 4.3 Conducted Output Power Measurement

#### 4.3.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

#### 4.3.2 Test Setup



#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.3.7 Test Results

##### FOR PEAK POWER

| Channel | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Limit (dBm) | Pass/Fail |
|---------|-----------------|-----------------|------------------|-------------|-----------|
| 1       | 915             | 90.573          | 19.57            | 30          | Pass      |

##### FOR AVERAGE POWER

| Channel | Frequency (MHz) | Average Power (mW) | Average Power (dBm) |
|---------|-----------------|--------------------|---------------------|
| 1       | 915             | 89.125             | 19.50               |

## 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.

If you have any comments, please feel free to contact us at the following:

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

--- END ---