

FCC Test Report (BT-LE)

Report No.: RF140808E04W-4

FCC ID: RYK-261ACNBT

Test Model: WNSQ-261ACN(BT)

Series Model: WPEQ-261ACN(BT)

Received Date: Oct. 26, 2017

Test Date: Nov. 17, 2017 to Jan. 07, 2018

Issued Date: Jan. 09, 2017

Applicant: SparkLAN Communications, Inc.

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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 |
|----------------|-------------------|---------------|
| RF140808E04W-4 | Original release. | Jan. 09, 2017 |

1 Certificate of Conformity

Product: 802.11ac/b/g/n Wi-Fi+BT Module

Brand: Sparklan

Test Model: WNSQ-261ACN(BT)

Series Model: WPEQ-261ACN(BT)

Sample Status: R&D SAMPLE

Applicant: SparkLAN Communications, Inc.

Test Date: Nov. 17, 2017 to Jan. 07, 2018

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:** Jan. 09, 2017
Wendy Wu / Specialist

Approved by : May Chen , **Date:** Jan. 09, 2017
May Chen / Manager

2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (SECTION 15.247) | | | |
|--|--|--------|--|
| FCC Clause | Test Item | Result | Remarks |
| 15.205 & 209 & 15.247(d) | Radiated Emissions & Band Edge Measurement | PASS | Meet the requirement of limit. Minimum passing margin is -3.7dB at 499.8MHz. |
| 15.247(b) | Conducted power | PASS | Meet the requirement of limit. |
| 15.203 | Antenna Requirement | Pass | Antenna connector is RP-SMA not a standard connector. |

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) |
|--------------------------------|---------------|--------------------------------------|
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz | 5.30 dB |
| | 1GHz ~ 6GHz | 5.16 dB |
| Radiated Emissions above 1 GHz | 6GHz ~ 18GHz | 4.91 dB |
| | 18GHz ~ 40GHz | 5.30 dB |

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-LE)

| | |
|-----------------------|--------------------------------|
| Product | 802.11ac/b/g/n Wi-Fi+BT Module |
| Brand | Sparklan |
| Test Model | WNSQ-261ACN(BT) |
| Series Model | WPEQ-261ACN(BT) |
| Status of EUT | R&D SAMPLE |
| Power Supply Rating | 3.3Vdc form host equipment |
| Modulation Type | GFSK |
| Modulation Technology | DTS |
| Transfer Rate | Up to 1Mbps |
| Operating Frequency | 2402MHz ~ 2480MHz |
| Number of Channel | 40 |
| Output Power | 0.9099mW |
| Antenna Type | Refer to Note |
| Antenna Connector | Refer to Note |
| Accessory Device | NA |
| Data Cable Supplied | NA |

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF140808E04S-4 as the following:

◆ Add Dipole antenna

| Original | | | | | | | | | |
|---------------------|------------|-------------------------|--------------|-----------------------------------|---|-------------------------|--|----------------|-------------------|
| Antenna set 1 | | | | | | | | | |
| Transmitter Circuit | Brand | Model | Antenna Type | 2.4GHz Gain with cable loss (dBi) | 5GHz Gain with cable loss (dBi) | 2.4GHz Cable Loss (dBi) | 5G Cable Loss (dBi) | Connector Type | Cable Length (mm) |
| Chain (0) | WNC | 81-EBJ15.005 | PIFA | 3.62 | Band 1&2: 3.08 Band 3: 4.76 Band 4: 4.76 | 1.15 | Band 1&2: 1.70 Band 3: 1.74 Band 4: 1.79 | IPEX | 300 |
| Chain (1) | WNC | 81-EBJ15.005 | PIFA | 3.62 | Band 1&2: 3.08 Band 3: 4.76 Band 4: 4.76 | 1.15 | Band 1&2: 1.70 Band 3: 1.74 Band 4: 1.79 | IPEX | 300 |
| Antenna set 2 | | | | | | | | | |
| Transmitter Circuit | Brand | Model | Antenna Type | 2.4GHz Gain with cable loss (dBi) | 5GHz Gain with cable loss (dBi) | Connector Type | Cable Length (mm) | | |
| Chain (0) | Tongda | T-543-8201044-A (Ant 1) | PIFA | 3.572 | Band 1&2: 3.002 Band 3: 4.546 Band 4: 4.416 | IPEX | 77 | | |
| Chain (1) | Tongda | T-543-8201044-A (Ant 2) | PIFA | 3.325 | Band 1&2: 2.942 Band 3: 4.622 Band 4: 4.586 | IPEX | 71 | | |
| Newly | | | | | | | | | |
| Antenna set 3 | | | | | | | | | |
| Transmitter Circuit | Brand | Model | Antenna Type | 2.4GHz Gain with cable loss (dBi) | 5GHz Gain with cable loss (dBi) | Connector Type | Cable Length (mm) | | |
| Chain (0) | Wanshih | R3410110203 WSS003 | Dipole | 2.02 | Band 1&2: 1.93 Band 3&4: 2.03 | RP-SMA | 150 | | |
| Chain (1) | Wanshih | R3410110203 WSS003 | Dipole | 2.02 | Band 1&2: 1.93 Band 3&4: 2.03 | RP-SMA | 150 | | |
| Antenna set 4 | | | | | | | | | |
| Transmitter Circuit | Brand | Model | Antenna Type | 2.4GHz Gain with cable loss (dBi) | 5GHz Gain with cable loss (dBi) | Connector Type | Cable Length (mm) | | |
| Chain (0) | Long Cheng | FDE_ACBSMA-BGP | Dipole | 3.27 | Band 1&2&3: 5.436 Band 4: 5.96 | RP-SMA | 150 | | |
| Chain (1) | Long Cheng | FDE_ACBSMA-BGP | Dipole | 3.27 | Band 1&2&3: 5.436 Band 4: 5.96 | RP-SMA | 150 | | |

Note:

1. Max gain was selected for Antenna Port Conducted Measurement test.
2. Antenna set 4 was selected for Radiated Emission Test.

2. According to above condition, only Radiated Emissions and Band Edge Measurement and Conducted power test items need to be performed. And all data were verified to meet the requirements.

3. All models are listed as below.

| Brand | Model | Difference |
|----------|-----------------|-----------------------|
| Sparklan | WNSQ-261ACN(BT) | LGA module |
| | WPEQ-261ACN(BT) | Half Mini PCIe Module |

From the above models, model: WNSQ-261ACN(BT) was selected as representative model for the test and its data was recorded in this report.

4. There are Bluetooth technology and WLAN technology used for the EUT.
5. WLAN <5GHz> and Bluetooth technology can transmit at same time.
6. The EUT support multiple function, therefore the WLAN OFDM will be cover BT OFDM (low power) scenario.
7. WNSQ-261ACN(BT), WPEQ-261ACN(BT) supports two digital interfaces (USB and UART) for Bluetooth digital end data communication. The Bluetooth RF end is exactly same in both implementations.

| Variant No. | Interface |
|-------------|-----------------------|
| SKU #1 | USB interface for BT |
| SKU #2 | UART interface for BT |

From the above Variants, SKU #1 was selected as representative model for the test and its data was recorded in this report.

8. The above EUT information was 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

40 channels are provided to this EUT:

| CHANNEL | FREQ. (MHz) | CHANNEL | FREQ. (MHz) | CHANNEL | FREQ. (MHz) | CHANNEL | FREQ. (MHz) |
|---------|----------------|---------|----------------|---------|----------------|---------|----------------|
| 0 | 2402 | 10 | 2422 | 20 | 2442 | 30 | 2462 |
| 1 | 2404 | 11 | 2424 | 21 | 2444 | 31 | 2464 |
| 2 | 2406 | 12 | 2426 | 22 | 2446 | 32 | 2466 |
| 3 | 2408 | 13 | 2428 | 23 | 2448 | 33 | 2468 |
| 4 | 2410 | 14 | 2430 | 24 | 2450 | 34 | 2470 |
| 5 | 2412 | 15 | 2432 | 25 | 2452 | 35 | 2472 |
| 6 | 2414 | 16 | 2434 | 26 | 2454 | 36 | 2474 |
| 7 | 2416 | 17 | 2436 | 27 | 2456 | 37 | 2476 |
| 8 | 2418 | 18 | 2438 | 28 | 2458 | 38 | 2478 |
| 9 | 2420 | 19 | 2440 | 29 | 2460 | 39 | 2480 |

3.2.1 Test Mode Applicability and Tested Channel Detail

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

Where **RE \geq 1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
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 TYPE | DATA RATE (Mbps) |
|-------------------|----------------|-----------------|------------------|
| 0 to 39 | 0, 19, 39 | GFSK | 1 |

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 TYPE | DATA RATE (Mbps) |
|-------------------|----------------|-----------------|------------------|
| 0 to 39 | 39 | GFSK | 1 |

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 TYPE | DATA RATE (Mbps) |
|-------------------|----------------|-----------------|------------------|
| 0 to 39 | 0, 19, 39 | GFSK | 1 |

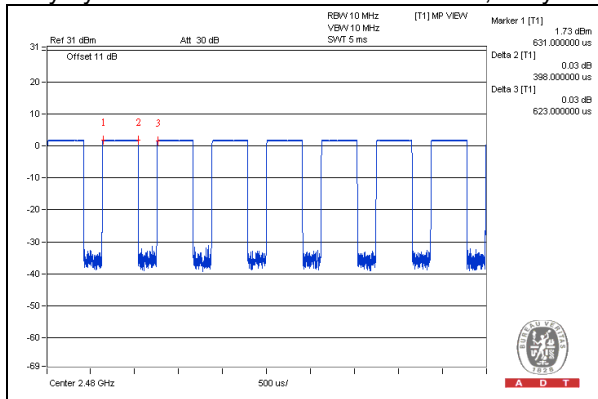
Test Condition:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER (SYSTEM) | TESTED BY |
|---------------|--------------------------|----------------------|---------------|
| RE \geq 1G | 24deg. C, 70%RH | 120Vac, 60Hz | Jyunchun Lin |
| RE<1G | 25deg. C, 64%RH | 120Vac, 60Hz | Jyunchun Lin |
| APCM | 25deg. C, 60%RH | 120Vac, 60Hz | Anderson Chen |

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

Duty cycle = $0.398 \text{ ms} / 0.623 \text{ ms} = 0.639$, Duty factor = $10 * \log(1/0.639) = 1.9$



3.4 Description of Support Units

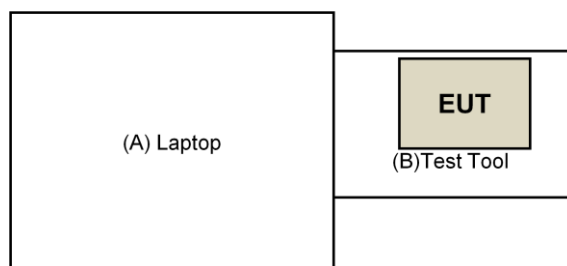
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| ID | Product | Brand | Model No. | Serial No. | FCC ID | Remarks |
|----|-----------|-------|-----------|------------|---------|--------------------|
| A. | Laptop | DELL | E6420 | B92T3R1 | FCC DoC | Provided by Lab |
| B. | Test Tool | NA | NA | NA | NA | Supplied by client |

Note:

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

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 DTS Meas Guidance v04
ANSI C63.10-2013

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

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

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

For Radiated Emission above 1GHz test:

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--|----------------------|--------------------|-----------------|------------------|
| Test Receiver Keysight | N9038A | MY54450088 | July 08, 2017 | July 07, 2018 |
| Horn_Antenna SCHWARZBECK | BBHA 9120D | 9120D-783 | Dec. 12, 2017 | Dec. 11, 2018 |
| Pre-Amplifier EMCI | EMC12630SE | 980385 | Feb. 02, 2017 | Feb. 01, 2018 |
| RF Cable | EMC104-SM-SM-1200 | 160923 | Feb. 02, 2017 | Feb. 01, 2018 |
| | EMC104-SM-SM-2000 | 150318 | Mar. 29, 2017 | Mar. 28, 2018 |
| | EMC104-SM-SM-5000 | 150321 | Mar. 29, 2017 | Mar. 28, 2018 |
| Pre-Amplifier EMCI | EMC184045SE | 980387 | Feb. 02, 2017 | Feb. 01, 2018 |
| Horn_Antenna SCHWARZBECK | BBHA 9170 | BBHA9170608 | Dec. 14, 2017 | Dec. 13, 2018 |
| RF Cable | SUCOFLEX 102 | 36432/2 36433/2 | Jan. 15, 2017 | Jan. 14, 2018 |
| Software | ADT_Radiated_V8.7.08 | NA | NA | NA |
| Antenna Tower & Turn Table Max-Full | MF-7802 | MF780208410 | NA | NA |
| Boresight Antenna Fixture | FBA-01 | FBA-SIP02 | 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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The CANADA Site Registration No. is 20331-2
5. Tested Date: Jan. 06 to 07, 2018

For other test items:

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--|----------------------|-------------------------------|-----------------|------------------|
| Test Receiver Keysight | N9038A | MY54450088 | July 08, 2017 | July 07, 2018 |
| Pre-Amplifier ^(*) EMCI | EMC001340 | 980142 | Jan. 20, 2016 | Jan. 19, 2018 |
| Loop Antenna ^(*) Electro-Metrics | EM-6879 | 264 | Dec. 16, 2016 | Dec. 15, 2018 |
| RF Cable | NA | LOOPCAB-001 LOOPCAB-002 | Jan. 17, 2017 | Jan. 16, 2018 |
| Pre-Amplifier Mini-Circuits | ZFL-1000VH2B | AMP-ZFL-01 | Nov. 09, 2017 | Nov. 08, 2018 |
| Trilog Broadband Antenna SCHWARZBECK | VULB 9168 | 9168-406 | Dec. 13, 2016 | Dec. 12, 2017 |
| RF Cable | 8D | 966-4-1 966-4-2 966-4-3 | Apr. 01, 2017 | Mar. 31, 2018 |
| Fixed attenuator Mini-Circuits | UNAT-5+ | PAD-3m-4-01 | Oct. 03, 2017 | Oct. 02, 2018 |
| Software | ADT_Radiated_V8.7.08 | NA | NA | NA |
| Antenna Tower & Turn Table Max-Full | MF-7802 | MF780208410 | NA | NA |
| Boresight Antenna Fixture | FBA-01 | FBA-SIP02 | NA | NA |
| Power meter Anritsu | ML2495A | 1014008 | May 11, 2017 | May 10, 2018 |
| Power sensor Anritsu | MA2411B | 0917122 | May 11, 2017 | May 10, 2018 |

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 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The CANADA Site Registration No. is 20331-2
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: Nov. 17 to Dec. 11, 2017

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. Both X and Y axes 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 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:

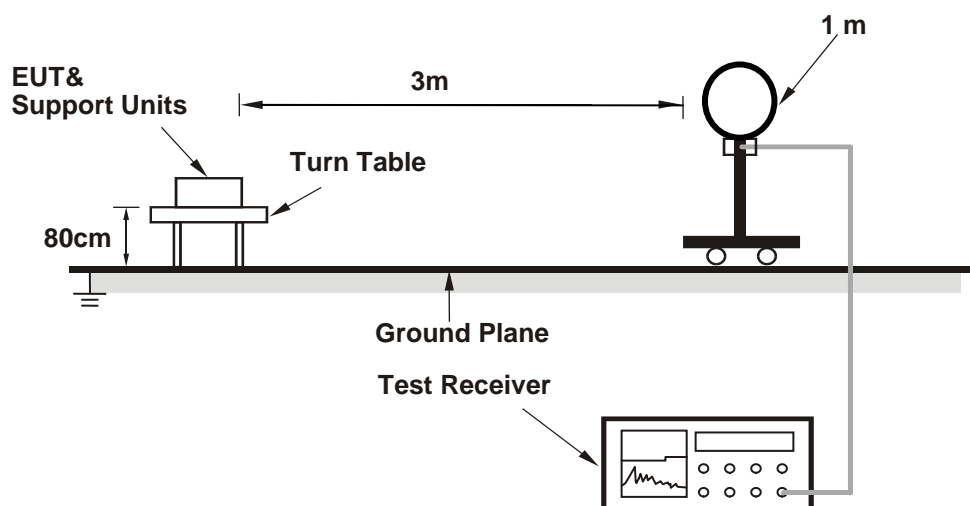
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

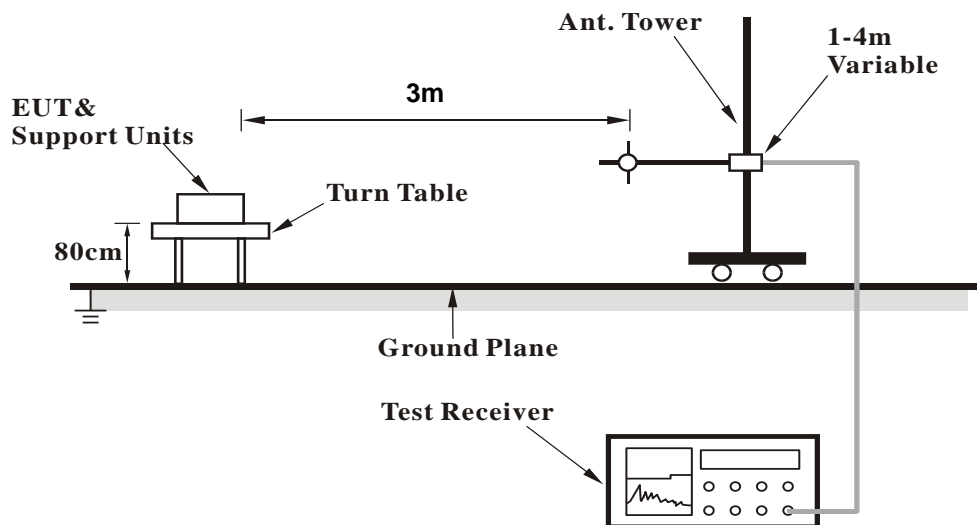
No deviation.

4.1.5 Test Setup

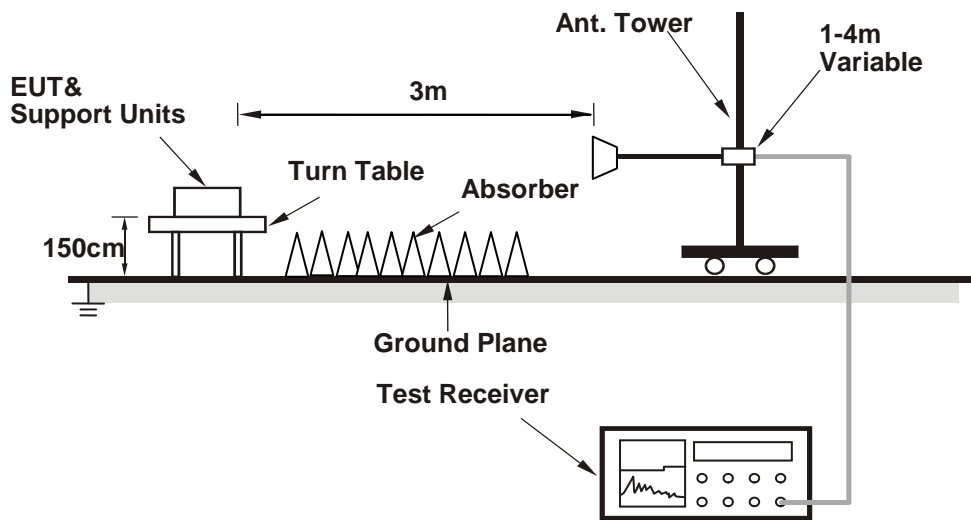
For Radiated emission below 30MHz



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 (QRCT CONN.exe V3.0.197.0) has been activated to set the EUT on specific status.

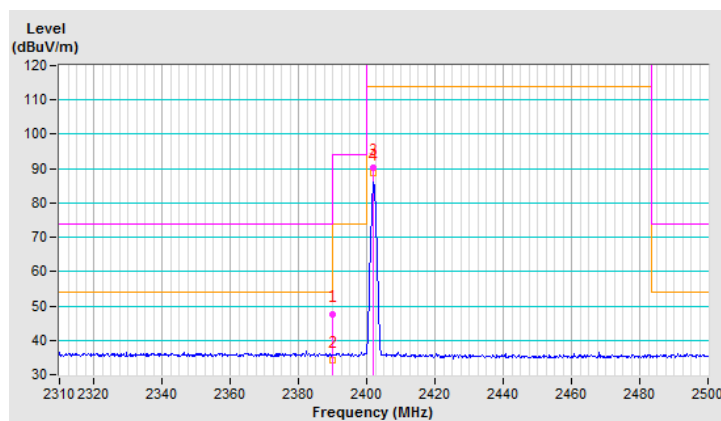
4.1.7 Test Results (Bandedge)

| | | | |
|------------------------|--------------|--------------------------|--------------|
| CHANNEL | TX Channel 0 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| 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 | 2390.00 | 47.4 PK | 74.0 | -26.6 | 1.24 H | 270 | 48.4 | -1.0 |
| 2 | 2390.00 | 34.2 AV | 54.0 | -19.8 | 1.24 H | 270 | 35.2 | -1.0 |
| 3 | *2402.00 | 90.2 PK | | | 1.24 H | 270 | 91.2 | -1.0 |
| 4 | *2402.00 | 88.6 AV | | | 1.24 H | 270 | 89.6 | -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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

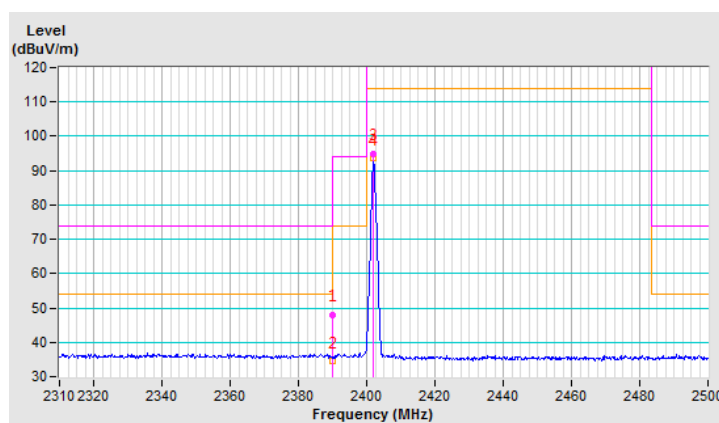


| | | | |
|------------------------|--------------|------------------------------|--------------|
| CHANNEL | TX Channel 0 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL 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 | 2390.00 | 48.1 PK | 74.0 | -25.9 | 3.87 V | 71 | 49.1 | -1.0 |
| 2 | 2390.00 | 34.7 AV | 54.0 | -19.3 | 3.87 V | 71 | 35.7 | -1.0 |
| 3 | *2402.00 | 95.0 PK | | | 3.87 V | 71 | 96.0 | -1.0 |
| 4 | *2402.00 | 93.6 AV | | | 3.87 V | 71 | 94.6 | -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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

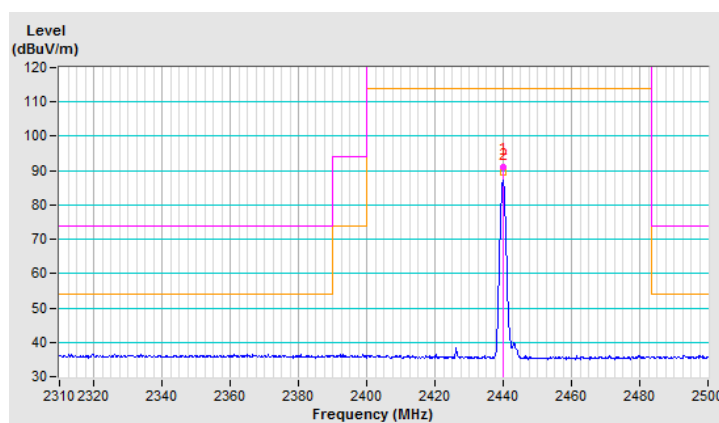


| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 19 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| 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 | *2440.00 | 91.0 PK | | | 1.23 H | 242 | 92.4 | -1.4 |
| 2 | *2440.00 | 89.4 AV | | | 1.23 H | 242 | 90.8 | -1.4 |

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

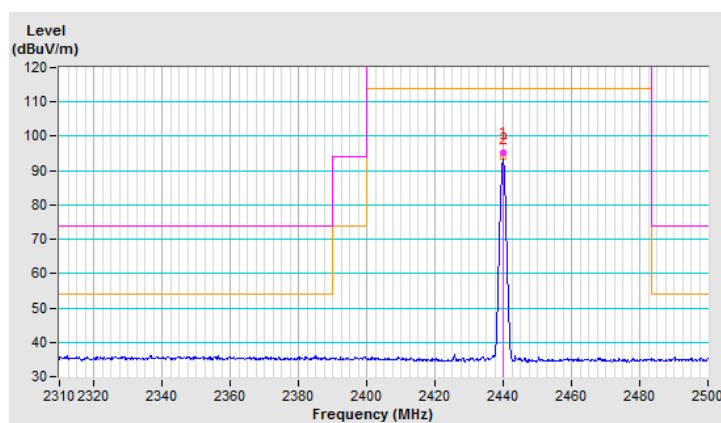


| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 19 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL 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 | *2440.00 | 95.4 PK | | | 3.84 V | 86 | 96.8 | -1.4 |
| 2 | *2440.00 | 94.1 AV | | | 3.84 V | 86 | 95.5 | -1.4 |

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

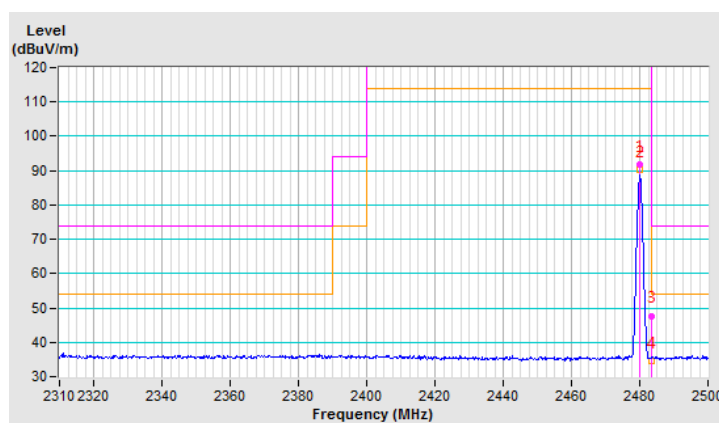


| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| 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 | *2480.00 | 91.7 PK | | | 1.25 H | 255 | 93.0 | -1.3 |
| 2 | *2480.00 | 90.2 AV | | | 1.25 H | 255 | 91.5 | -1.3 |
| 3 | 2483.50 | 47.7 PK | 74.0 | -26.3 | 1.25 H | 255 | 48.9 | -1.2 |
| 4 | 2483.50 | 34.5 AV | 54.0 | -19.5 | 1.25 H | 255 | 35.7 | -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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

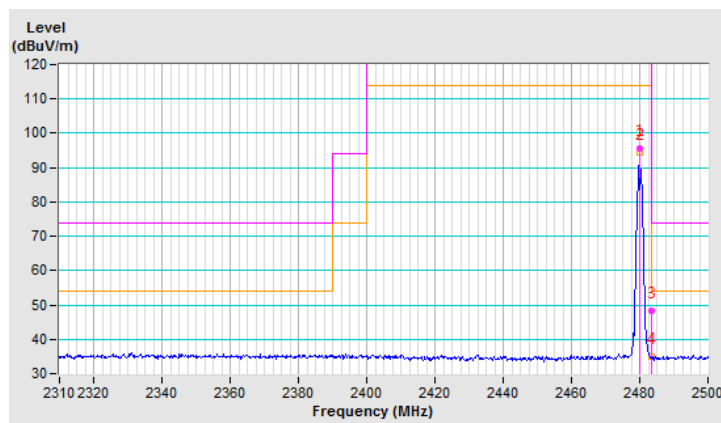


| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL 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 | *2480.00 | 95.7 PK | | | 4.00 V | 75 | 97.0 | -1.3 |
| 2 | *2480.00 | 94.4 AV | | | 4.00 V | 75 | 95.7 | -1.3 |
| 3 | 2483.50 | 48.2 PK | 74.0 | -25.8 | 4.00 V | 75 | 49.4 | -1.2 |
| 4 | 2483.50 | 34.8 AV | 54.0 | -19.2 | 4.00 V | 75 | 36.0 | -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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.



4.1.8 Test Results (Spurious emission)

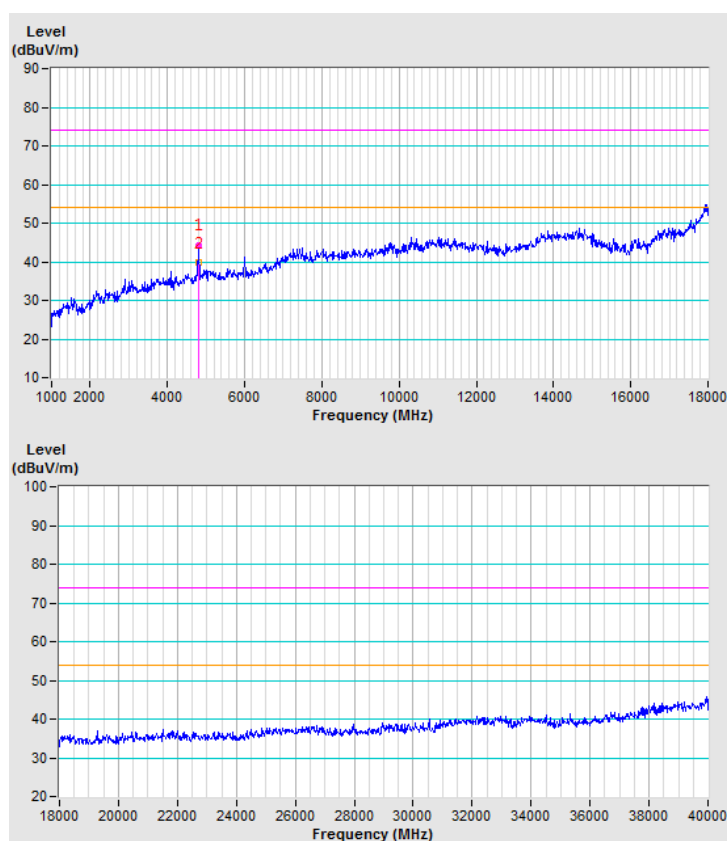
Above 1GHz Data:

| | | | |
|------------------------|--------------|--------------------------|--------------|
| CHANNEL | TX Channel 0 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| 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 | 4804.00 | 44.4 PK | 74.0 | -29.6 | 1.10 H | 287 | 41.3 | 3.1 |
| 2 | 4804.00 | 39.7 AV | 54.0 | -14.3 | 1.10 H | 287 | 36.6 | 3.1 |

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

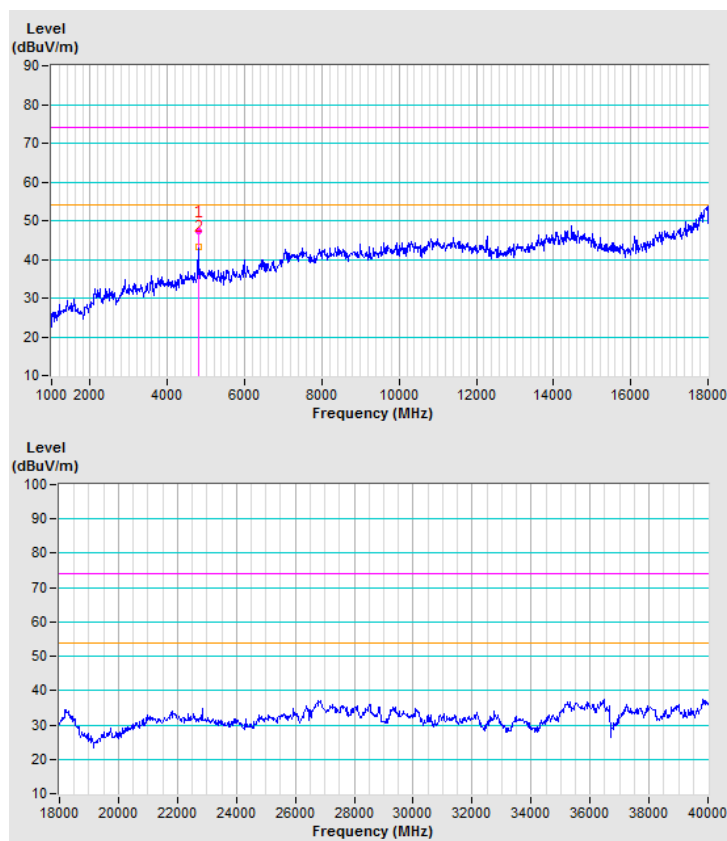


| | | | |
|------------------------|--------------|--------------------------|--------------|
| CHANNEL | TX Channel 0 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL 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 | 4804.00 | 47.2 PK | 74.0 | -26.8 | 2.84 V | 129 | 44.1 | 3.1 |
| 2 | 4804.00 | 43.3 AV | 54.0 | -10.7 | 2.84 V | 129 | 40.2 | 3.1 |

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

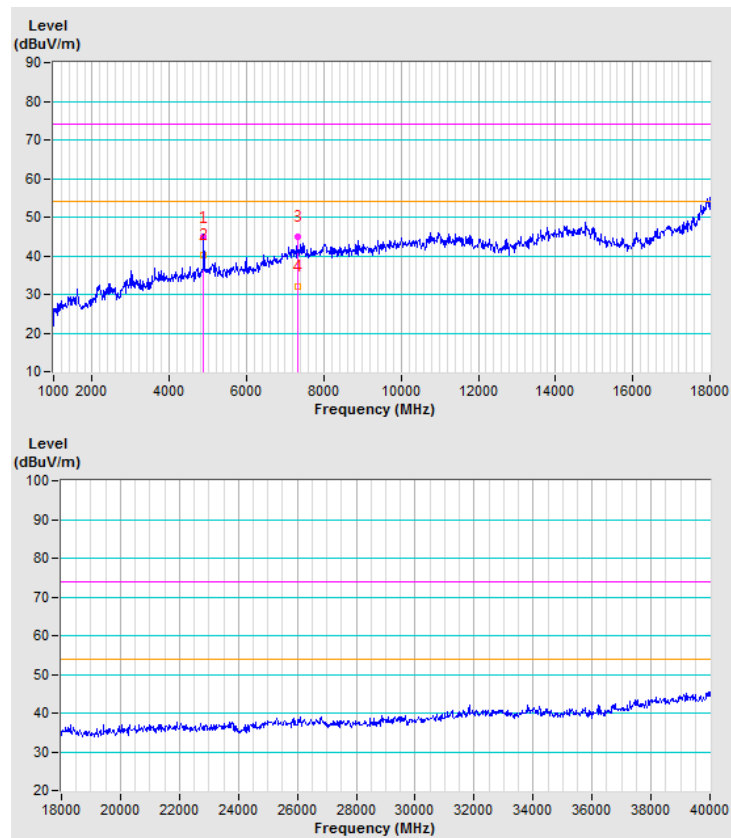


| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 19 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| 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 | 4880.00 | 44.8 PK | 74.0 | -29.2 | 1.07 H | 289 | 41.5 | 3.3 |
| 2 | 4880.00 | 40.3 AV | 54.0 | -13.7 | 1.07 H | 289 | 37.0 | 3.3 |
| 3 | 7320.00 | 44.9 PK | 74.0 | -29.1 | 1.02 H | 213 | 34.9 | 10.0 |
| 4 | 7320.00 | 32.0 AV | 54.0 | -22.0 | 1.02 H | 213 | 22.0 | 10.0 |

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

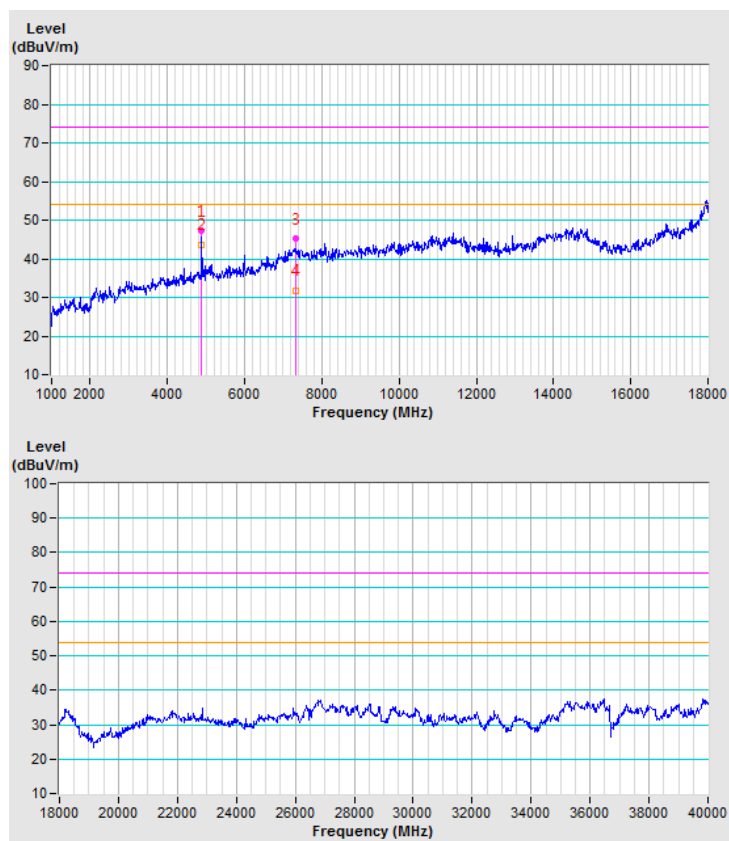


| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 19 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL 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 | 4880.00 | 47.2 PK | 74.0 | -26.8 | 2.80 V | 133 | 43.9 | 3.3 |
| 2 | 4880.00 | 43.5 AV | 54.0 | -10.5 | 2.80 V | 133 | 40.2 | 3.3 |
| 3 | 7320.00 | 45.1 PK | 74.0 | -28.9 | 1.55 V | 126 | 35.1 | 10.0 |
| 4 | 7320.00 | 31.8 AV | 54.0 | -22.2 | 1.55 V | 126 | 21.8 | 10.0 |

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

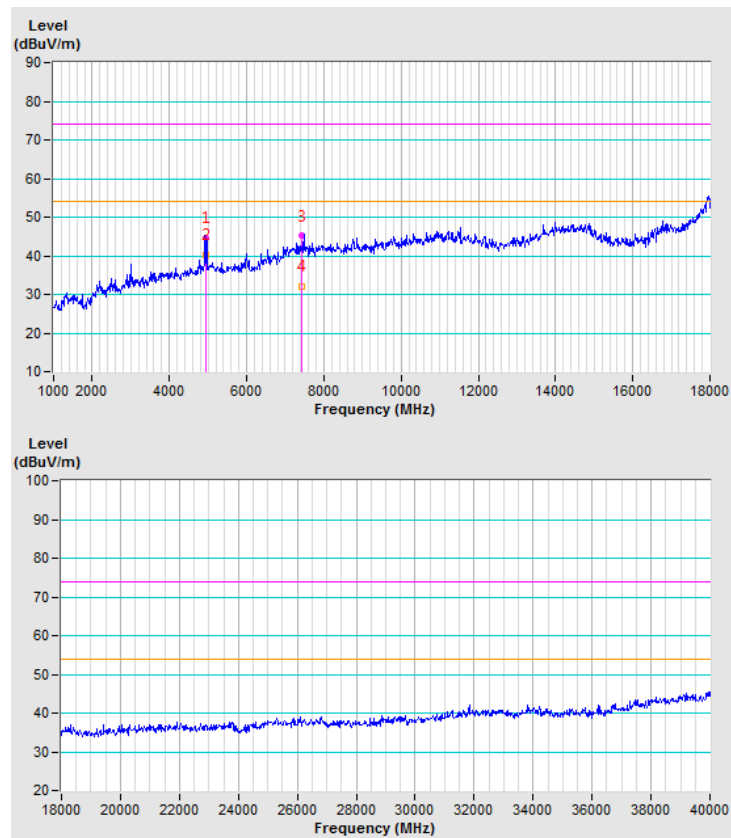


| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| 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 | 4960.00 | 44.5 PK | 74.0 | -29.5 | 1.04 H | 284 | 41.0 | 3.5 |
| 2 | 4960.00 | 40.1 AV | 54.0 | -13.9 | 1.04 H | 284 | 36.6 | 3.5 |
| 3 | 7440.00 | 45.1 PK | 74.0 | -28.9 | 1.00 H | 200 | 35.0 | 10.1 |
| 4 | 7440.00 | 32.0 AV | 54.0 | -22.0 | 1.00 H | 200 | 21.9 | 10.1 |

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

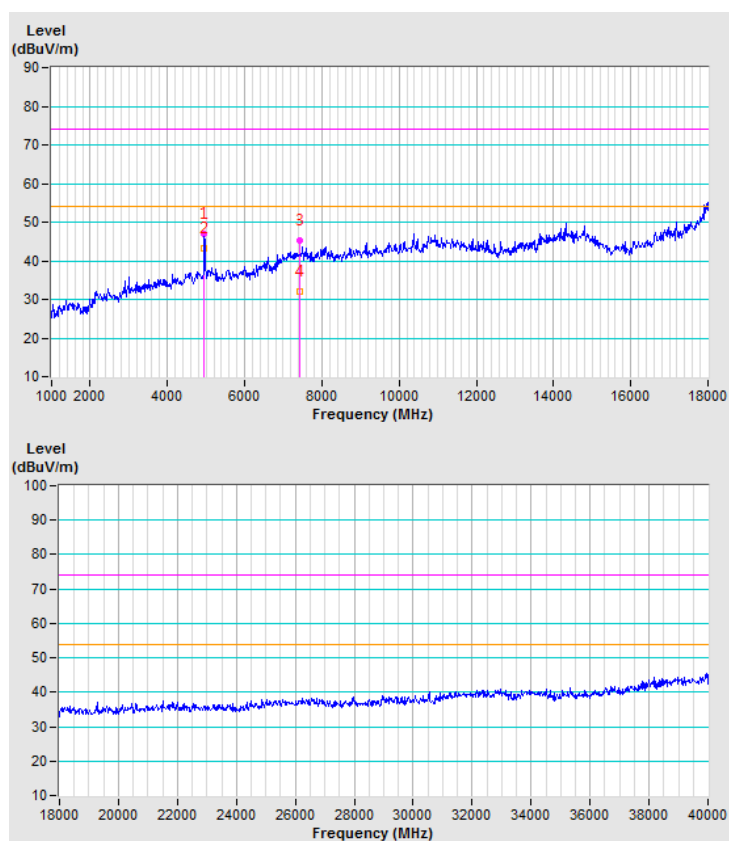


| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL 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 | 4960.00 | 47.0 PK | 74.0 | -27.0 | 2.78 V | 142 | 43.5 | 3.5 |
| 2 | 4960.00 | 43.2 AV | 54.0 | -10.8 | 2.78 V | 142 | 39.7 | 3.5 |
| 3 | 7440.00 | 45.3 PK | 74.0 | -28.7 | 1.50 V | 111 | 35.2 | 10.1 |
| 4 | 7440.00 | 32.2 AV | 54.0 | -21.8 | 1.50 V | 111 | 22.1 | 10.1 |

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



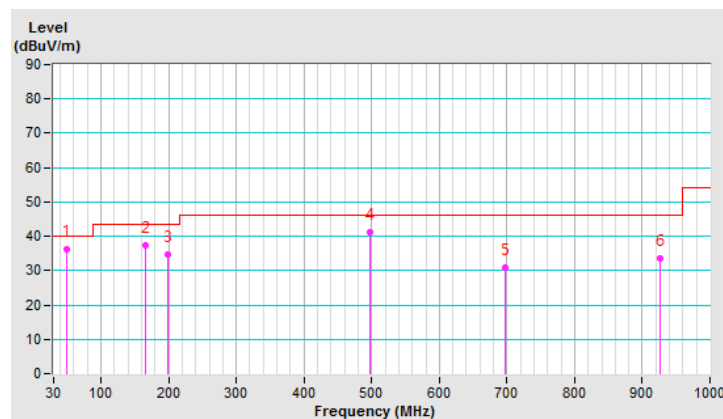
Below 1GHz Data:

| | | | |
|-----------------|---------------|----------------------|-----------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 9kHz ~ 1GHz | | |

| 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 | 49.40 | 36.1 QP | 40.0 | -3.9 | 3.00 H | 93 | 44.1 | -8.0 |
| 2 | 166.05 | 37.3 QP | 43.5 | -6.2 | 2.50 H | 283 | 45.6 | -8.3 |
| 3 | 199.20 | 34.6 QP | 43.5 | -8.9 | 2.50 H | 156 | 46.0 | -11.4 |
| 4 | 497.91 | 41.0 QP | 46.0 | -5.0 | 2.50 H | 11 | 43.8 | -2.8 |
| 5 | 697.00 | 30.7 QP | 46.0 | -15.3 | 2.50 H | 295 | 29.9 | 0.8 |
| 6 | 925.43 | 33.6 QP | 46.0 | -12.4 | 1.50 H | 48 | 29.1 | 4.5 |

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

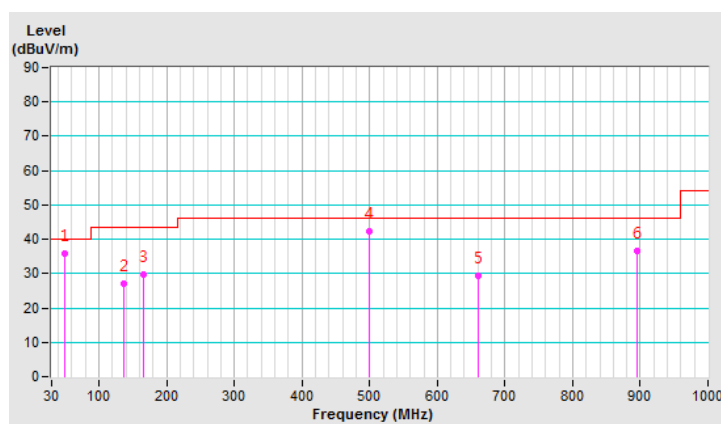


| | | | |
|------------------------|---------------|--------------------------|-----------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 9kHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL 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 | 49.40 | 35.7 QP | 40.0 | -4.3 | 1.00 V | 240 | 43.7 | -8.0 |
| 2 | 137.33 | 27.1 QP | 43.5 | -16.4 | 1.00 V | 157 | 35.5 | -8.4 |
| 3 | 166.60 | 29.7 QP | 43.5 | -13.8 | 2.00 V | 77 | 38.0 | -8.3 |
| 4 | 499.80 | 42.3 QP | 46.0 | -3.7 | 1.50 V | 64 | 45.1 | -2.8 |
| 5 | 660.06 | 29.2 QP | 46.0 | -16.8 | 1.50 V | 42 | 28.8 | 0.4 |
| 6 | 896.20 | 36.5 QP | 46.0 | -9.5 | 1.50 V | 89 | 32.7 | 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

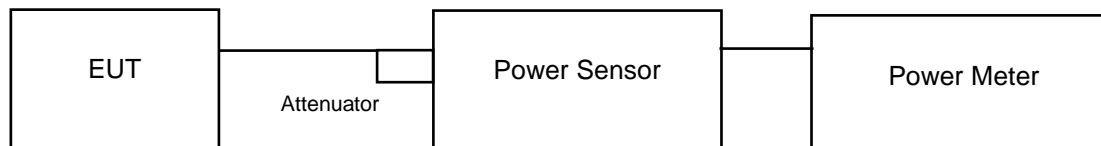


4.2 Conducted Output Power Measurement

4.2.1 Limits OF Conducted Output Power Measurement

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

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedures

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

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Conditions

Same as Item 4.3.6.

4.2.7 Test Results

FOR PEAK POWER

| Channel | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Limit (dBm) | Pass/Fail |
|---------|-----------------|-----------------|------------------|-------------|-----------|
| 0 | 2402 | 0.7852 | -1.05 | 30 | Pass |
| 19 | 2440 | 0.859 | -0.66 | 30 | Pass |
| 39 | 2480 | 0.9099 | -0.41 | 30 | Pass |

FOR AVERAGE POWER

| Channel | Frequency (MHz) | Average Power (mW) | Average Power (dBm) |
|---------|-----------------|--------------------|---------------------|
| 0 | 2402 | 0.7129 | -1.47 |
| 19 | 2440 | 0.7852 | -1.05 |
| 39 | 2480 | 0.8241 | -0.84 |

5 Pictures of Test Arrangements

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

Appendix – Information on 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:

Linkou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---