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RADIO TEST REPORT

Report No:STS1911022W01

Issued for

VURO LLC

1441 Broadway, Suite 5011, New York, NY 10018, USA

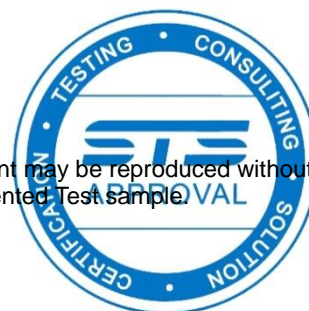
| | |
|-----------------------|------------------|
| Product Name: | VURO PanicButton |
| Brand Name: | VURO |
| Model Name: | V-BUTTON |
| Series Model: | V-BUTTON-1 |
| FCC ID: | 2AUBHV-BUTTON |
| Test Standard: | FCC Part 15.247 |

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**TEST RESULT CERTIFICATION****Applicant's Name**.....: VURO LLC

Address: 1441 Broadway, Suite 5011, New York, NY 10018, USA

Manufacture's Name.....: VURO LLC

Address: 1441 Broadway, Suite 5011, New York, NY 10018, USA

Product Description

Product Name.....: VURO PanicButton

Brand Name: VURO

Model Name: V-BUTTON

Series Model.....: V-BUTTON-1

Test Standards: FCC Part15.247

Test Procedure: ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test

Date (s) of performance of tests: 07 Nov. 2019 ~ 12 Nov. 2019

Date of Issue.....: 15 Nov. 2019

Test Result.....: **Pass**

Testing Engineer :

(Chris Chen)

Technical Manager :

(Sunday Hu)

Authorized Signatory :

(Vita Li)





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**Revision History**

| Rev. | Issue Date | Report NO. | Effect Page | Contents |
|------|--------------|---------------|-------------|---------------|
| 00 | 15 Nov. 2019 | STS1911022W01 | ALL | Initial Issue |
| | | | | |





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02

| FCC Part 15.247,Subpart C | | | |
|-------------------------------|---|----------|--------|
| Standard Section | Test Item | Judgment | Remark |
| 15.207 | Conducted Emission | N/A | -- |
| 15.247 (a)(2) | 6dB Bandwidth | PASS | -- |
| 15.247 (b)(3) | Output Power | PASS | -- |
| 15.247 (c) | Radiated Spurious Emission | PASS | -- |
| 15.247 (d) | Conducted Spurious & Band Edge Emission | PASS | -- |
| 15.247 (e) | Power Spectral Density | PASS | -- |
| 15.205 | Restricted Band Edge Emission | PASS | -- |
| Part 15.247(d)/part 15.209(a) | Band Edge Emission | PASS | -- |
| 15.203 | Antenna Requirement | PASS | -- |

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report
- (2) All tests are according to ANSI C63.10-2013



1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

| No. | Item | Uncertainty |
|-----|-----------------------------------|----------------------|
| 1 | RF output power, conducted | $\pm 0.68\text{dB}$ |
| 2 | Unwanted Emissions, conducted | $\pm 2.988\text{dB}$ |
| 3 | All emissions, radiated 30-1GHz | $\pm 6.7\text{dB}$ |
| 4 | All emissions, radiated 1G-6GHz | $\pm 5.5\text{dB}$ |
| 5 | All emissions, radiated >6G | $\pm 5.8\text{dB}$ |
| 6 | Conducted Emission (9KHz-150KHz) | $\pm 4.43\text{dB}$ |
| 7 | Conducted Emission (150KHz-30MHz) | $\pm 5\text{dB}$ |



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

| | | |
|-------------------------|--|--------------------|
| Product Name | VURO PanicButton | |
| Trade Name | VURO | |
| Model Name | V-BUTTON | |
| Series Model | V-BUTTON-1 | |
| Model Difference | Only different in model name. | |
| Product Description | The EUT is a VURO PanicButton | |
| | Operation Frequency: | 2402~2480 MHz |
| | Modulation Type: | GFSK |
| | Radio Technology: | BLE |
| | Bluetooth Version: | 4.2 |
| | Bluetooth Configuration: | LE |
| | Number Of Channel: | 40 |
| | Antenna Designation: | Please see Note 3. |
| | Antenna Gain (dBi) | -3.0 dBi |
| Channel List | Please refer to the Note 2. | |
| Battery | Rated Voltage: 3.0V Charge Limit: N/A Capacity: 210mAh | |
| Hardware version number | Q80-HY-V3 | |
| Software version number | N/A | |
| Connecting I/O Port(s) | Please refer to the User's Manual | |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



2.

| Channel List | | | | | | | |
|--------------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 00 | 2402 | 10 | 2422 | 20 | 2442 | 30 | 2462 |
| 01 | 2404 | 11 | 2424 | 21 | 2444 | 31 | 2464 |
| 02 | 2406 | 12 | 2426 | 22 | 2446 | 32 | 2466 |
| 03 | 2408 | 13 | 2428 | 23 | 2448 | 33 | 2468 |
| 04 | 2410 | 14 | 2430 | 24 | 2450 | 34 | 2470 |
| 05 | 2412 | 15 | 2432 | 25 | 2452 | 35 | 2472 |
| 06 | 2414 | 16 | 2434 | 26 | 2454 | 36 | 2474 |
| 07 | 2416 | 17 | 2436 | 27 | 2456 | 37 | 2476 |
| 08 | 2418 | 18 | 2438 | 28 | 2458 | 38 | 2478 |
| 09 | 2420 | 19 | 2440 | 29 | 2460 | 39 | 2480 |

3.

Table for Filed Antenna

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | NOTE |
|------|-------|------------|--------------|-----------|------------|----------|
| 1 | VURO | V-BUTTON | PCB | N/A | -3.0 dBi | BLE ANT. |





2.2 DESCRIPTION OF THE TEST MODES

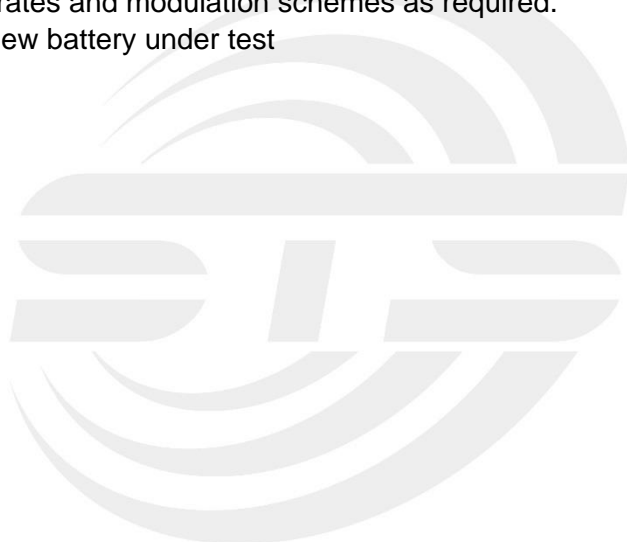
For conducted test items and radiated spurious emissions

Each of these EUT operation mode(s) or test configuration mode(s) mentioned below was evaluated respectively.

| Worst Mode | Description | Data/Modulation |
|------------|------------------|-----------------|
| Mode 1 | TX CH00(2402MHz) | 1 Mbps/GFSK |
| Mode 2 | TX CH19(2440MHz) | 1 Mbps/GFSK |
| Mode 3 | TX CH39(2480MHz) | 1 Mbps/GFSK |

Note:

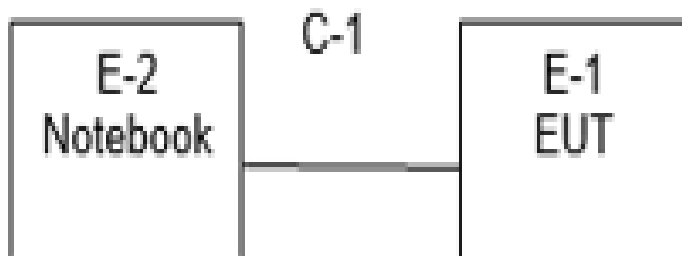
- (1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported
- (2) Controlled using a bespoke application on the laptop PC supplied by the customer. The application was used to enable a continuous transmission mode and to select the test channels, data rates and modulation schemes as required.
- (3) The EUT use new battery under test





2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND 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.

Necessary accessories

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|------|-----------|-----------|----------------|------------|------|
| N/A | N/A | N/A | N/A | N/A | N/A |
| | | | | | |
| | | | | | |
| | | | | | |

Support units

| Item | Equipment | Mfr/Brand | Model/Type No. | Serial No. | Note |
|------|-----------|-----------|----------------|------------|------|
| E-2 | Notebook | DELL | VOSTRO.3800 | N/A | N/A |
| C-1 | USB Cable | N/A | 100cm | N/A | N/A |
| | | | | | |
| | | | | | |

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



2.5 EQUIPMENTS LIST

Radiation Test equipment

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|----------------------------------|--------------|----------------------------|------------------|------------------|------------------|
| Test Receiver | R&S | ESCI | 101427 | 2019.07.29 | 2020.07.28 |
| Signal Analyzer | Agilent | N9020A | MY51110105 | 2019.03.02 | 2020.03.01 |
| Active loop Antenna | ZHINAN | ZN30900C | 16035 | 2018.03.11 | 2021.03.10 |
| Bilog Antenna | TESEQ | CBL6111D | 34678 | 2017.11.02 | 2020.11.01 |
| Horn Antenna | SCHWARZBECK | BBHA 9120D(1201) | 9120D-1343 | 2018.10.19 | 2021.10.18 |
| SHF-EHF Horn Antenna (18G-40GHz) | A-INFO | LB-180400-KF | J211020657 | 2018.03.11 | 2021.03.10 |
| Pre-Amplifier(0.1M-3G Hz) | EM | EM330 | 060665 | 2019.10.09 | 2020.10.08 |
| Pre-Amplifier (1G-18GHz) | SKET | LNPA-01018G-45 | SK201808090 1 | 2019.10.09 | 2020.10.08 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2019.10.09 | 2020.10.08 |
| turn table | EM | SC100_1 | 60531 | N/A | N/A |
| Antenna mast | EM | SC100 | N/A | N/A | N/A |
| Test SW | FARAD | EZ-EMC(Ver.STSLAB-03A1 RE) | | | |

RF Connected Test

| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|------------------------|--------------|-----------------|---------------|------------------|------------------|
| USB RF power sensor | DARE | RPR3006W | 15I00041SNO03 | 2019.10.09 | 2020.10.08 |
| Signal Analyzer | Agilent | N9020A | MY49100060 | 2019.10.09 | 2020.10.08 |
| Temperature & Humidity | HH660 | Mieo | N/A | 2019.10.12 | 2020.10.11 |
| Test SW | FARAD | LZ-RF /LzRf-3A3 | | | |



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) limit in the table below has to be followed.

| FREQUENCY (MHz) | Conducted Emission limit (dBuV) | |
|-----------------|---------------------------------|-----------|
| | Quasi-peak | Average |
| 0.15 -0.5 | 66 - 56 * | 56 - 46 * |
| 0.50 -5.0 | 56.00 | 46.00 |
| 5.0 -30.0 | 60.00 | 50.00 |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

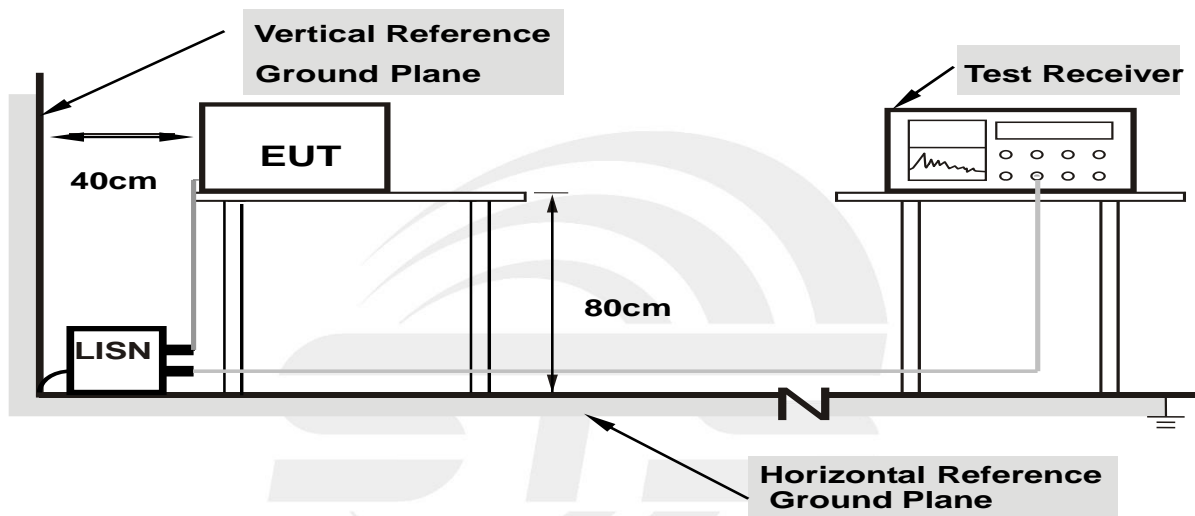
The following table is the setting of the receiver

| Receiver Parameters | Setting |
|---------------------|----------|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

3.2 TEST PROCEDURE

- The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 TEST SETUP



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

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.4 TEST RESULTS

| | | | |
|---------------|---------|--------------------|-------|
| Temperature: | 24.7(C) | Relative Humidity: | 60%RH |
| Test Voltage: | N/A | Phase: | L/N |
| Test Mode: | N/A | | |

Note: EUT is only power by battery, So it is not applicable for this test.



4. RADIATED EMISSION MEASUREMENT

4.1 RADIATED EMISSION LIMITS

in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (Frequency Range 9kHz-1000MHz)

| Frequencies (MHz) | Field Strength (micorvolts/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 |

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | (dBuV/m) (at 3M) | |
|-----------------|------------------|---------|
| | PEAK | AVERAGE |
| Above 1000 | 74 | 54 |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

| Spectrum Parameter | Setting |
|---------------------------------------|-------------------------------|
| Attenuation | Auto |
| Detector | Peak/AV |
| Start Frequency | 1000 MHz(Peak/AV) |
| Stop Frequency | 10th carrier hamonic(Peak/AV) |
| RB / VB (emission in restricted band) | 1 MHz / 3 MHz |

For Band edge

| Spectrum Parameter | Setting |
|---------------------------------------|--|
| Detector | Peak/AV |
| Start/Stop Frequency | Lower Band Edge: 2300 to 2403 MHz Upper Band Edge: 2479 to 2500 MHz |
| RB / VB (emission in restricted band) | 1 MHz / 3 MHz |



| Receiver Parameter | Setting |
|------------------------|--------------------------------------|
| Start ~ Stop Frequency | 9kHz~90kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 90kHz~110kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 110kHz~490kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 490kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

4.2 TEST PROCEDURE

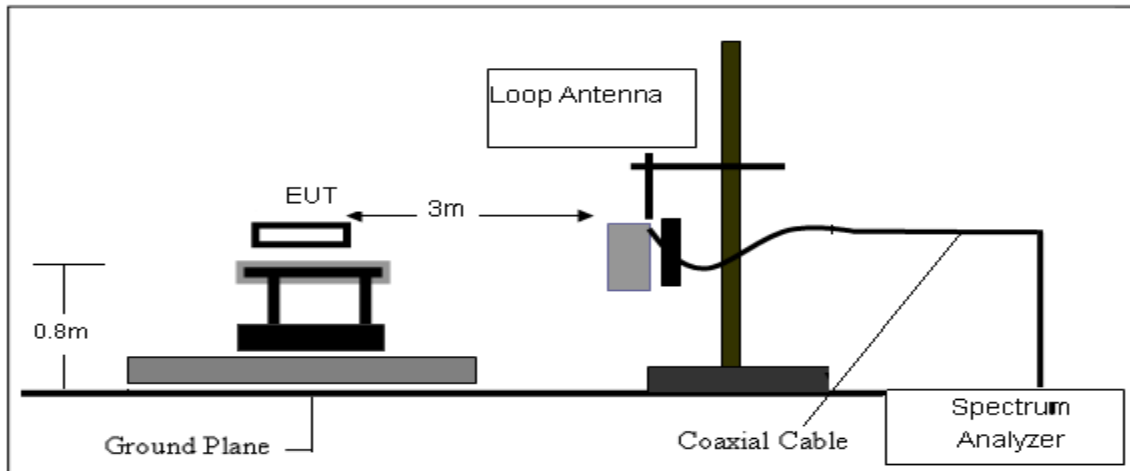
- The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
- The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarizations of the antenna are set to make the measurement
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

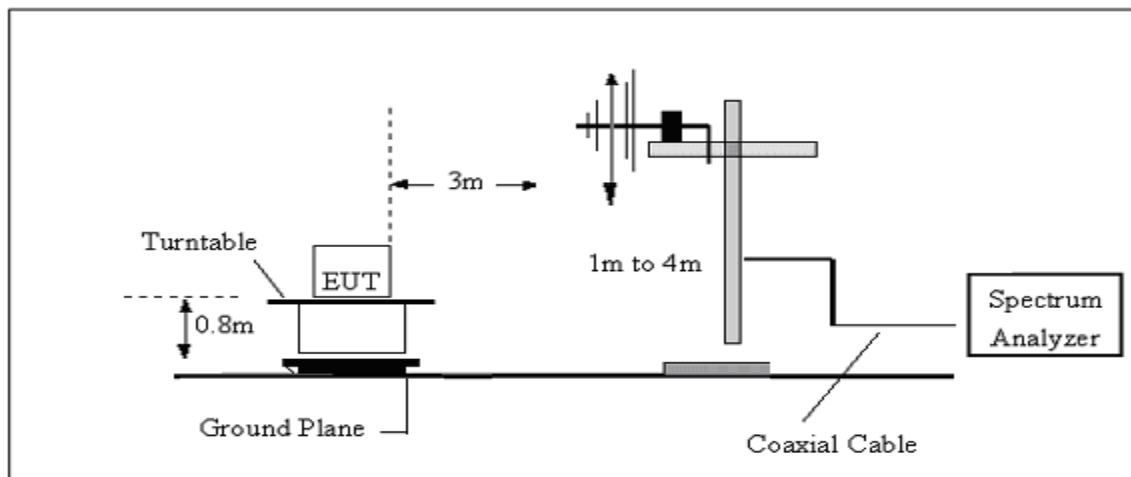
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

4.3 TEST SETUP

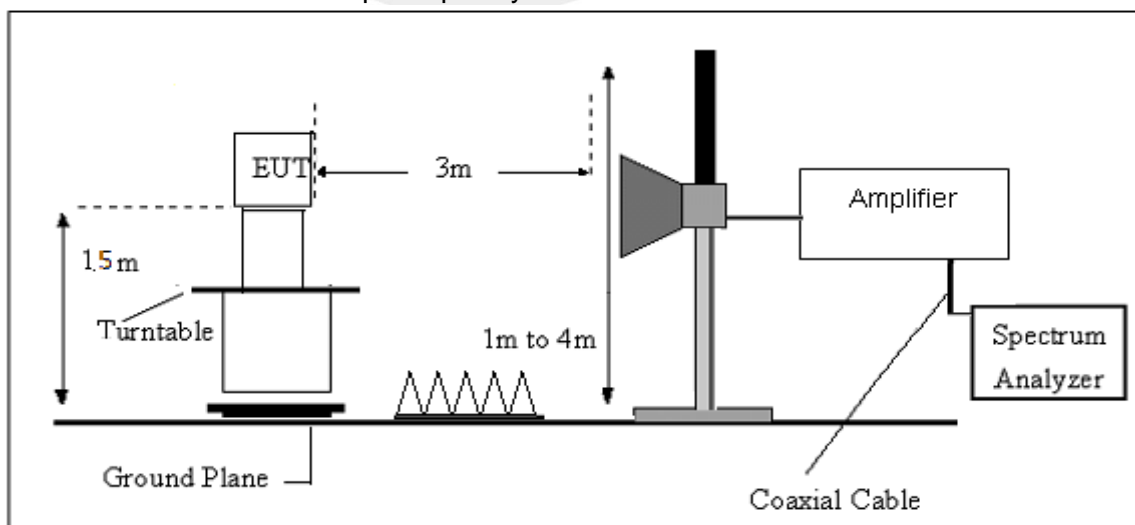
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



4.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



4.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

| Frequency | FS | RA | AF | CL | AG | Factor |
|-----------|----------|----------|------|------|------|--------|
| (MHz) | (dBμV/m) | (dBμV/m) | (dB) | (dB) | (dB) | (dB) |
| 300 | 40 | 58.1 | 12.2 | 1.6 | 31.9 | -18.1 |

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$





4.6 TEST RESULTS

(Between 9KHz – 30 MHz)

| | | | |
|---------------|----------------------|--------------------|-------|
| Temperature: | 24.7(C) | Relative Humidity: | 60%RH |
| Test Voltage: | DC 3.0V from battery | Polarization: | -- |
| Test Mode: | TX Mode | | |

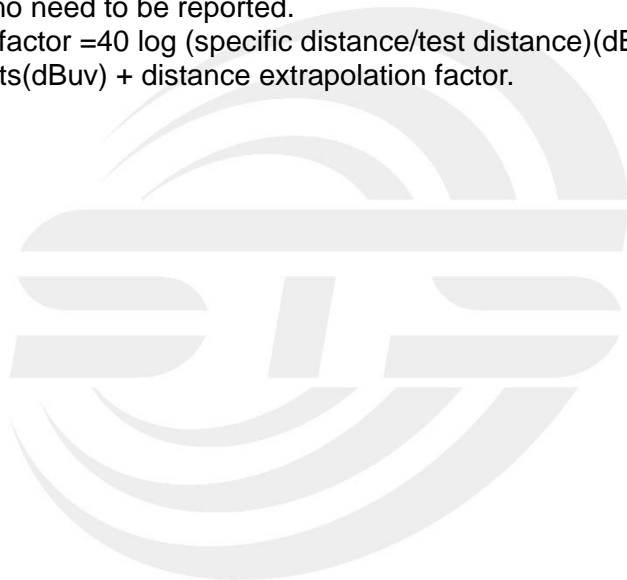
| Freq. | Reading | Limit | Margin | State |
|-------|----------|----------|--------|-------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F |
| -- | -- | -- | -- | PASS |
| -- | -- | -- | -- | PASS |

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.





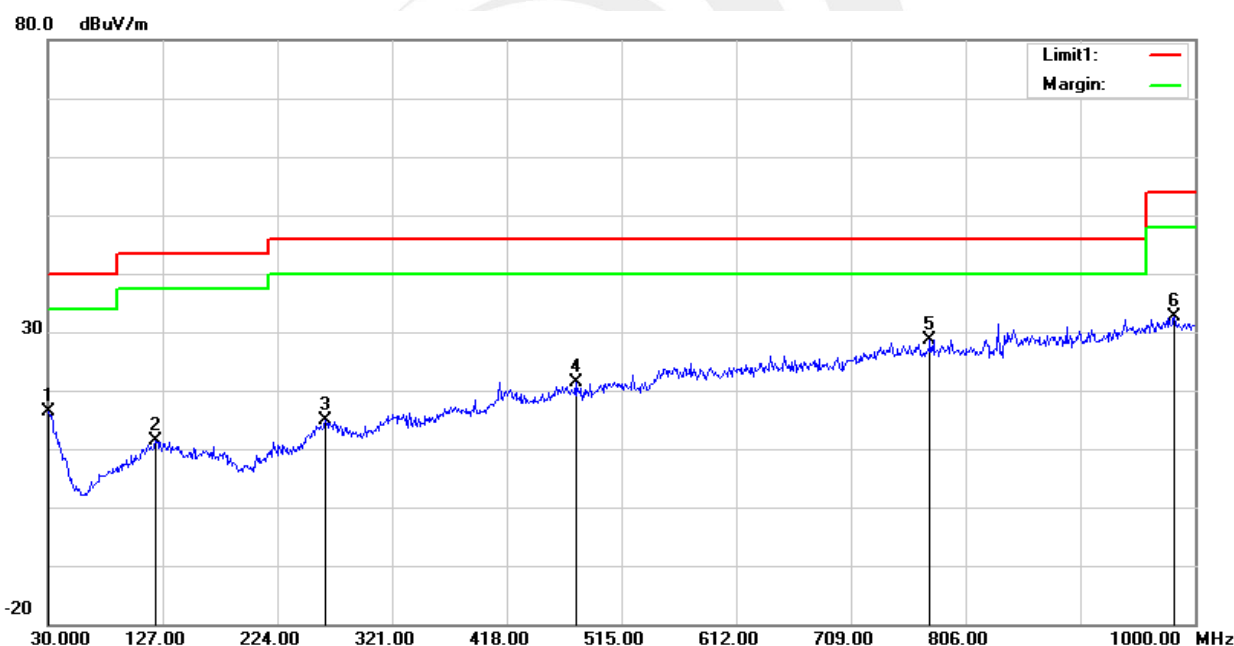
(30MHz -1000MHz)

| | | | |
|---------------|--------------------------------|--------------------|------------|
| Temperature: | 24.7(C) | Relative Humidity: | 60%RH |
| Test Voltage: | DC 3.0V from battery | Phase: | Horizontal |
| Test Mode: | Mode 1/2/3 (Mode 1 worst mode) | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/ m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-----------------------------|--------------------|-------------------|----------------|--------|
| 1 | 30.9700 | 29.74 | -13.35 | 16.39 | 40.00 | -23.61 | QP |
| 2 | 121.1800 | 29.81 | -18.32 | 11.49 | 43.50 | -32.01 | QP |
| 3 | 264.7400 | 29.55 | -14.75 | 14.80 | 46.00 | -31.20 | QP |
| 4 | 476.2000 | 30.06 | -8.78 | 21.28 | 46.00 | -24.72 | QP |
| 5 | 775.9300 | 30.87 | -2.26 | 28.61 | 46.00 | -17.39 | QP |
| 6 | 982.5400 | 30.01 | 2.52 | 32.53 | 54.00 | -21.47 | QP |

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit



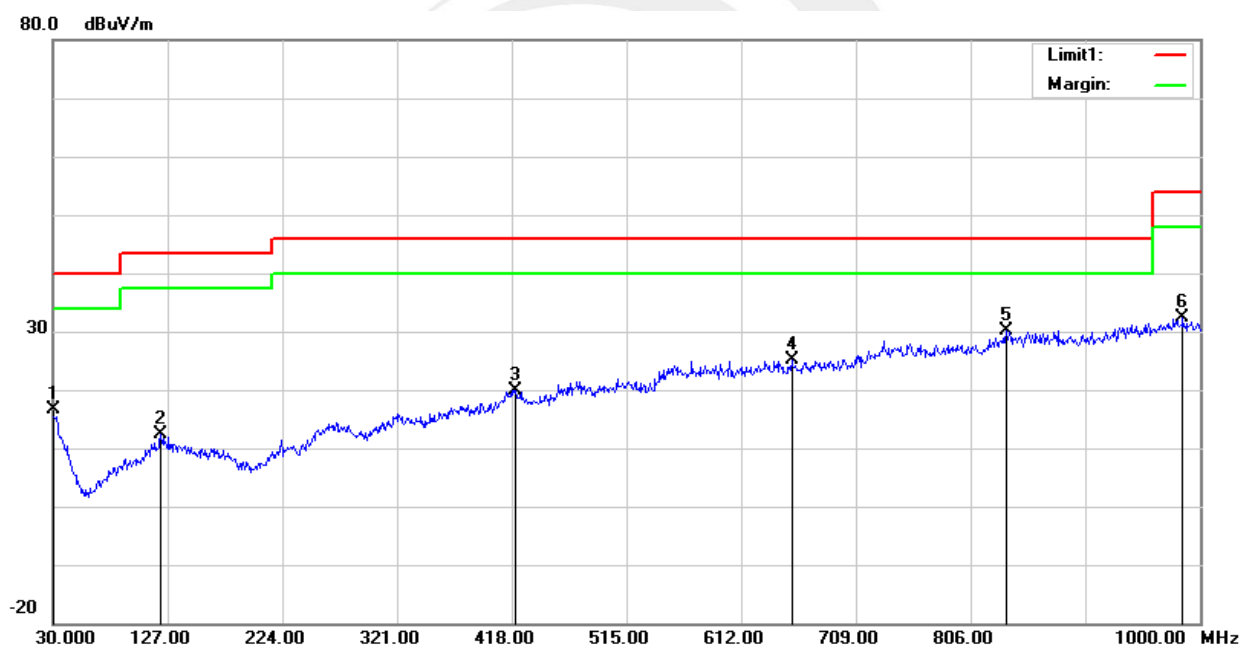


| | | | |
|---------------|--------------------------------|--------------------|----------|
| Temperature: | 24.7(C) | Relative Humidity: | 60%RH |
| Test Voltage: | DC 3.0V from battery | Phase: | Vertical |
| Test Mode: | Mode 1/2/3 (Mode 1 worst mode) | | |

| No. | Frequenc y (MHz) | Reading (dBuV) | Correct Factor(dB/ m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|------------------------|-------------------|-----------------------------|--------------------|-------------------|----------------|--------|
| 1 | 30.0000 | 29.54 | -12.85 | 16.69 | 40.00 | -23.31 | QP |
| 2 | 121.1800 | 30.58 | -18.32 | 12.26 | 43.50 | -31.24 | QP |
| 3 | 420.9100 | 30.00 | -10.09 | 19.91 | 46.00 | -26.09 | QP |
| 4 | 654.6800 | 30.02 | -4.86 | 25.16 | 46.00 | -20.84 | QP |
| 5 | 836.0700 | 30.55 | -0.50 | 30.05 | 46.00 | -15.95 | QP |
| 6 | 985.4500 | 29.99 | 2.33 | 32.32 | 54.00 | -21.68 | QP |

Remark:

1. Margin = Result (Result =Reading + Factor)-Limit





(1GHz-25GHz)Restricted band and Spurious emission Requirements

GFSK

| Frequency | Meter Reading | Amplifier | Loss | Antenna Factor | Orrected Factor | Emission Level | Limits | Margin | Detector | Comment |
|---------------------------|---------------|-----------|-------|----------------|-----------------|----------------|----------|--------|----------|------------|
| (MHz) | (dBμV) | (dB) | (dB) | (dB/m) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type | |
| Low Channel (2402 MHz) | | | | | | | | | | |
| 3264.83 | 61.32 | 44.70 | 6.70 | 28.20 | -9.80 | 51.52 | 74.00 | -22.48 | PK | Vertical |
| 3264.83 | 50.76 | 44.70 | 6.70 | 28.20 | -9.80 | 40.96 | 54.00 | -13.04 | AV | Vertical |
| 3264.62 | 62.05 | 44.70 | 6.70 | 28.20 | -9.80 | 52.25 | 74.00 | -21.75 | PK | Horizontal |
| 3264.62 | 50.65 | 44.70 | 6.70 | 28.20 | -9.80 | 40.85 | 54.00 | -13.15 | AV | Horizontal |
| 4804.35 | 59.29 | 44.20 | 9.04 | 31.60 | -3.56 | 55.73 | 74.00 | -18.27 | PK | Vertical |
| 4804.35 | 49.48 | 44.20 | 9.04 | 31.60 | -3.56 | 45.92 | 54.00 | -8.08 | AV | Vertical |
| 4804.51 | 58.31 | 44.20 | 9.04 | 31.60 | -3.56 | 54.75 | 74.00 | -19.25 | PK | Horizontal |
| 4804.51 | 49.88 | 44.20 | 9.04 | 31.60 | -3.56 | 46.32 | 54.00 | -7.68 | AV | Horizontal |
| 5359.62 | 48.88 | 44.20 | 9.86 | 32.00 | -2.34 | 46.54 | 74.00 | -27.46 | PK | Vertical |
| 5359.62 | 39.10 | 44.20 | 9.86 | 32.00 | -2.34 | 36.76 | 54.00 | -17.24 | AV | Vertical |
| 5359.81 | 47.95 | 44.20 | 9.86 | 32.00 | -2.34 | 45.61 | 74.00 | -28.39 | PK | Horizontal |
| 5359.81 | 38.99 | 44.20 | 9.86 | 32.00 | -2.34 | 36.65 | 54.00 | -17.35 | AV | Horizontal |
| 7205.98 | 53.59 | 43.50 | 11.40 | 35.50 | 3.40 | 56.99 | 74.00 | -17.01 | PK | Vertical |
| 7205.98 | 43.79 | 43.50 | 11.40 | 35.50 | 3.40 | 47.19 | 54.00 | -6.81 | AV | Vertical |
| 7205.72 | 54.36 | 43.50 | 11.40 | 35.50 | 3.40 | 57.76 | 74.00 | -16.24 | PK | Horizontal |
| 7205.72 | 44.23 | 43.50 | 11.40 | 35.50 | 3.40 | 47.63 | 54.00 | -6.37 | AV | Horizontal |
| Middle Channel (2440 MHz) | | | | | | | | | | |
| 3264.82 | 61.08 | 44.70 | 6.70 | 28.20 | -9.80 | 51.28 | 74.00 | -22.72 | PK | Vertical |
| 3264.82 | 51.51 | 44.70 | 6.70 | 28.20 | -9.80 | 41.71 | 54.00 | -12.29 | AV | Vertical |
| 3264.68 | 60.85 | 44.70 | 6.70 | 28.20 | -9.80 | 51.05 | 74.00 | -22.95 | PK | Horizontal |
| 3264.68 | 50.52 | 44.70 | 6.70 | 28.20 | -9.80 | 40.72 | 54.00 | -13.28 | AV | Horizontal |
| 4880.33 | 58.44 | 44.20 | 9.04 | 31.60 | -3.56 | 54.88 | 74.00 | -19.12 | PK | Vertical |
| 4880.33 | 50.42 | 44.20 | 9.04 | 31.60 | -3.56 | 46.86 | 54.00 | -7.14 | AV | Vertical |
| 4880.49 | 59.25 | 44.20 | 9.04 | 31.60 | -3.56 | 55.69 | 74.00 | -18.31 | PK | Horizontal |
| 4880.49 | 50.22 | 44.20 | 9.04 | 31.60 | -3.56 | 46.66 | 54.00 | -7.34 | AV | Horizontal |
| 5359.67 | 48.49 | 44.20 | 9.86 | 32.00 | -2.34 | 46.15 | 74.00 | -27.85 | PK | Vertical |
| 5359.67 | 39.18 | 44.20 | 9.86 | 32.00 | -2.34 | 36.84 | 54.00 | -17.16 | AV | Vertical |
| 5359.60 | 47.26 | 44.20 | 9.86 | 32.00 | -2.34 | 44.92 | 74.00 | -29.08 | PK | Horizontal |
| 5359.60 | 38.03 | 44.20 | 9.86 | 32.00 | -2.34 | 35.69 | 54.00 | -18.31 | AV | Horizontal |
| 7320.69 | 54.94 | 43.50 | 11.40 | 35.50 | 3.40 | 58.34 | 74.00 | -15.66 | PK | Vertical |
| 7320.69 | 44.64 | 43.50 | 11.40 | 35.50 | 3.40 | 48.04 | 54.00 | -5.96 | AV | Vertical |
| 7320.95 | 54.20 | 43.50 | 11.40 | 35.50 | 3.40 | 57.60 | 74.00 | -16.40 | PK | Horizontal |
| 7320.95 | 44.62 | 43.50 | 11.40 | 35.50 | 3.40 | 48.02 | 54.00 | -5.98 | AV | Horizontal |



| High Channel (2480 MHz) | | | | | | | | | | |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|--------|----|------------|
| 3264.74 | 61.19 | 44.70 | 6.70 | 28.20 | -9.80 | 51.39 | 74.00 | -22.61 | PK | Vertical |
| 3264.74 | 51.64 | 44.70 | 6.70 | 28.20 | -9.80 | 41.84 | 54.00 | -12.16 | AV | Vertical |
| 3264.84 | 61.33 | 44.70 | 6.70 | 28.20 | -9.80 | 51.53 | 74.00 | -22.47 | PK | Horizontal |
| 3264.84 | 50.32 | 44.70 | 6.70 | 28.20 | -9.80 | 40.52 | 54.00 | -13.48 | AV | Horizontal |
| 4960.30 | 58.87 | 44.20 | 9.04 | 31.60 | -3.56 | 55.31 | 74.00 | -18.69 | PK | Vertical |
| 4960.30 | 50.43 | 44.20 | 9.04 | 31.60 | -3.56 | 46.87 | 54.00 | -7.13 | AV | Vertical |
| 4960.33 | 58.68 | 44.20 | 9.04 | 31.60 | -3.56 | 55.12 | 74.00 | -18.88 | PK | Horizontal |
| 4960.33 | 50.23 | 44.20 | 9.04 | 31.60 | -3.56 | 46.67 | 54.00 | -7.33 | AV | Horizontal |
| 5359.69 | 49.04 | 44.20 | 9.86 | 32.00 | -2.34 | 46.70 | 74.00 | -27.30 | PK | Vertical |
| 5359.69 | 39.95 | 44.20 | 9.86 | 32.00 | -2.34 | 37.61 | 54.00 | -16.39 | AV | Vertical |
| 5359.58 | 47.29 | 44.20 | 9.86 | 32.00 | -2.34 | 44.95 | 74.00 | -29.05 | PK | Horizontal |
| 5359.58 | 38.74 | 44.20 | 9.86 | 32.00 | -2.34 | 36.40 | 54.00 | -17.60 | AV | Horizontal |
| 7439.93 | 54.66 | 43.50 | 11.40 | 35.50 | 3.40 | 58.06 | 74.00 | -15.94 | PK | Vertical |
| 7439.93 | 44.95 | 43.50 | 11.40 | 35.50 | 3.40 | 48.35 | 54.00 | -5.65 | AV | Vertical |
| 7439.88 | 54.75 | 43.50 | 11.40 | 35.50 | 3.40 | 58.15 | 74.00 | -15.85 | PK | Horizontal |
| 7439.88 | 43.80 | 43.50 | 11.40 | 35.50 | 3.40 | 47.20 | 54.00 | -6.80 | AV | Horizontal |

Note:

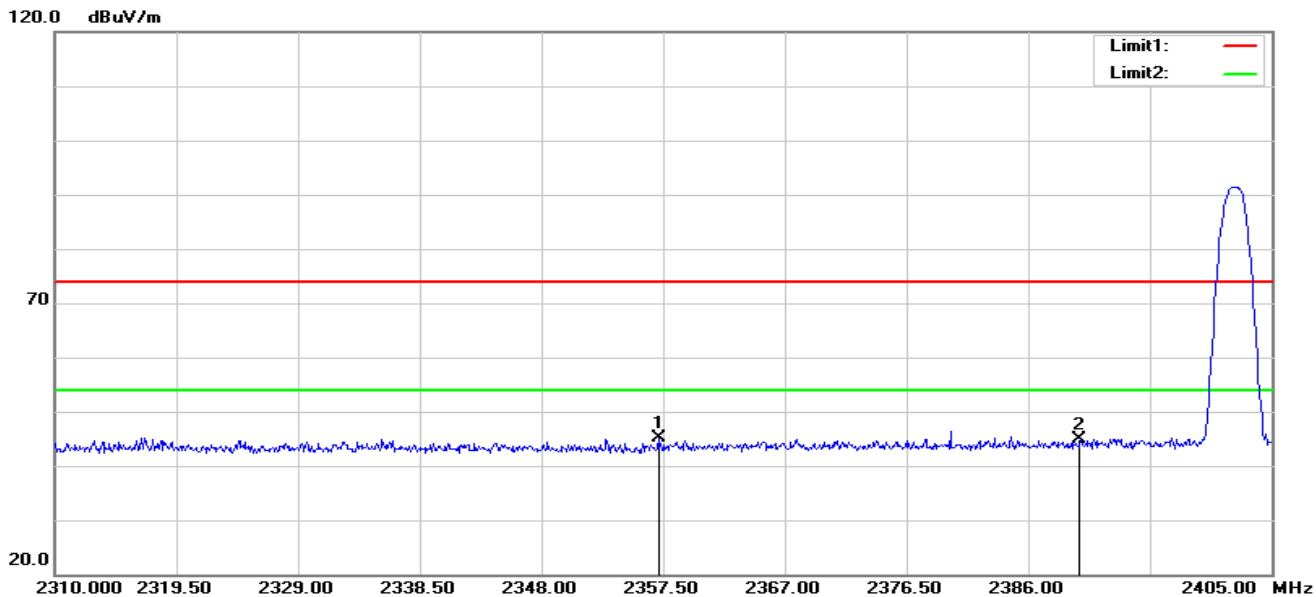
1) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

2) The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.

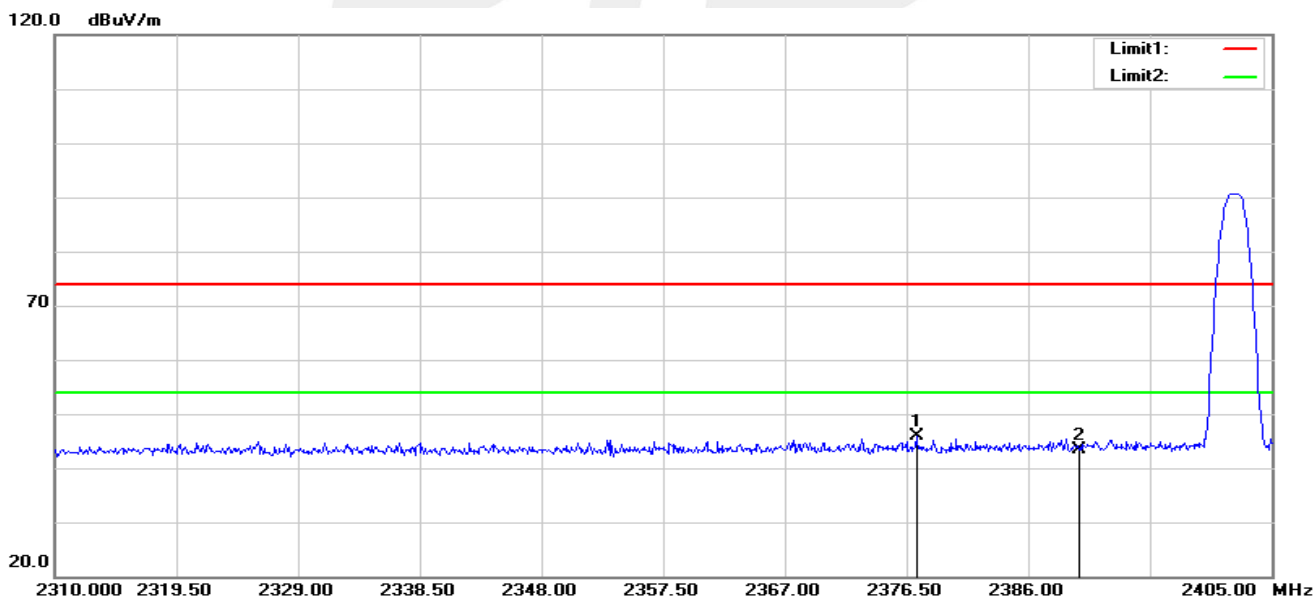


4.6 TEST RESULTS (Restricted Bands Requirements)

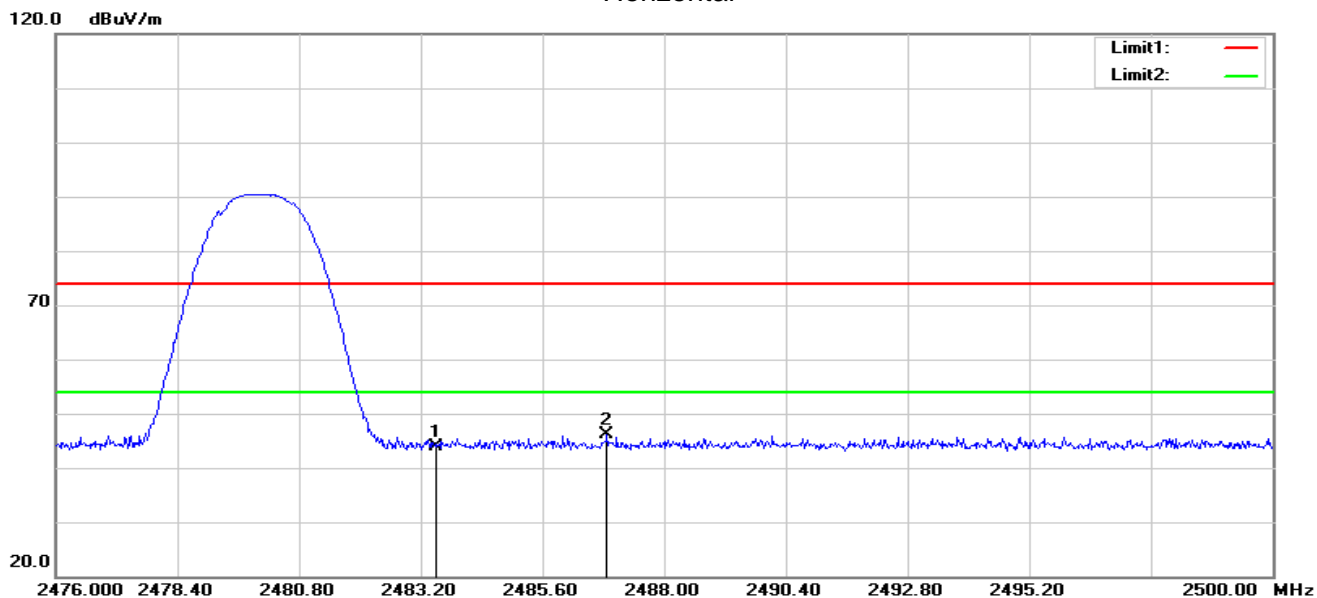
GFSK-Low
Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 | 2357.120 | 41.18 | 3.84 | 45.02 | 74.00 | -28.98 | peak |
| 2 | 2390.000 | 40.43 | 4.34 | 44.77 | 74.00 | -29.23 | peak |

Vertical

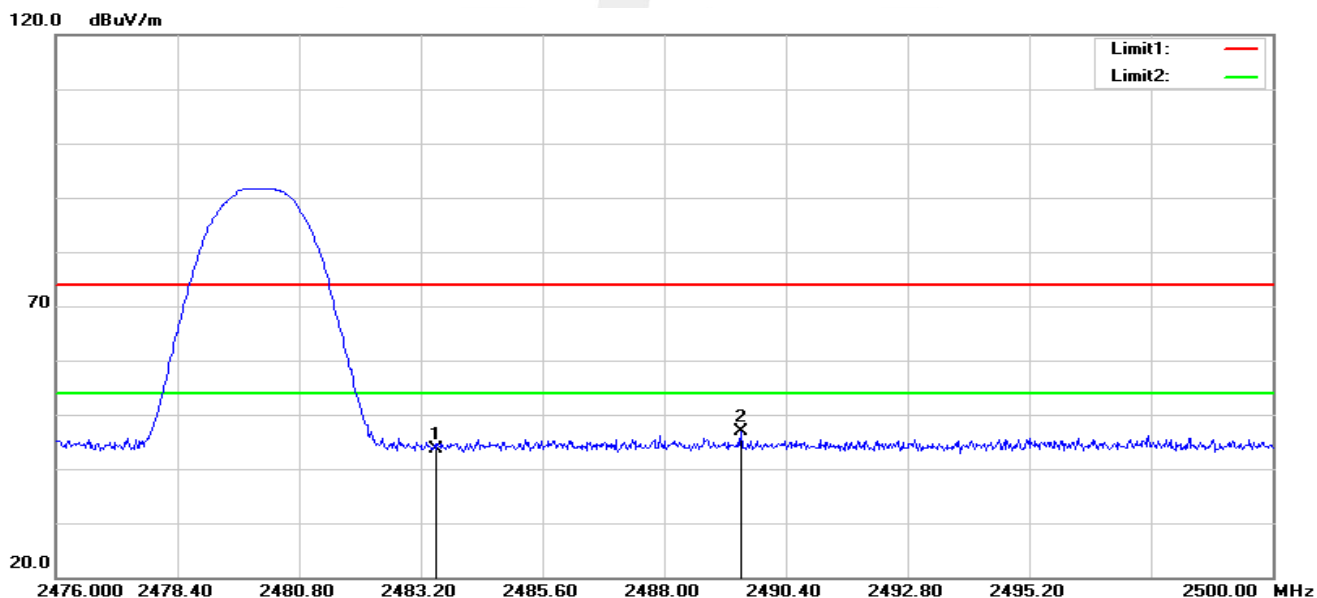


| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 | 2377.260 | 41.62 | 4.15 | 45.77 | 74.00 | -28.23 | peak |
| 2 | 2390.000 | 39.08 | 4.34 | 43.42 | 74.00 | -30.58 | peak |

**GFSK-High**
Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 | 2483.500 | 39.29 | 4.60 | 43.89 | 74.00 | -30.11 | peak |
| 2 | 2486.872 | 41.41 | 4.62 | 46.03 | 74.00 | -27.97 | peak |

Vertical



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|-------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 | 2483.500 | 39.09 | 4.60 | 43.69 | 74.00 | -30.31 | peak |
| 2 | 2489.512 | 42.19 | 4.62 | 46.81 | 74.00 | -27.19 | peak |

5. CONDUCTED SPURIOUS & BAND EDGE EMISSION

5.1 LIMIT

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

5.2 TEST PROCEDURE

| Spectrum Parameter | Setting |
|---------------------------------------|---------------------------------|
| Detector | Peak |
| Start/Stop Frequency | 30 MHz to 10th carrier harmonic |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

For Band edge

| Spectrum Parameter | Setting |
|---------------------------------------|--|
| Detector | Peak |
| Start/Stop Frequency | Lower Band Edge: 2300 – 2407 MHz Upper Band Edge: 2475 – 2500 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

5.3 TEST SETUP



The EUT which is powered by the Battery, is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

5.4 EUT OPERATION CONDITIONS

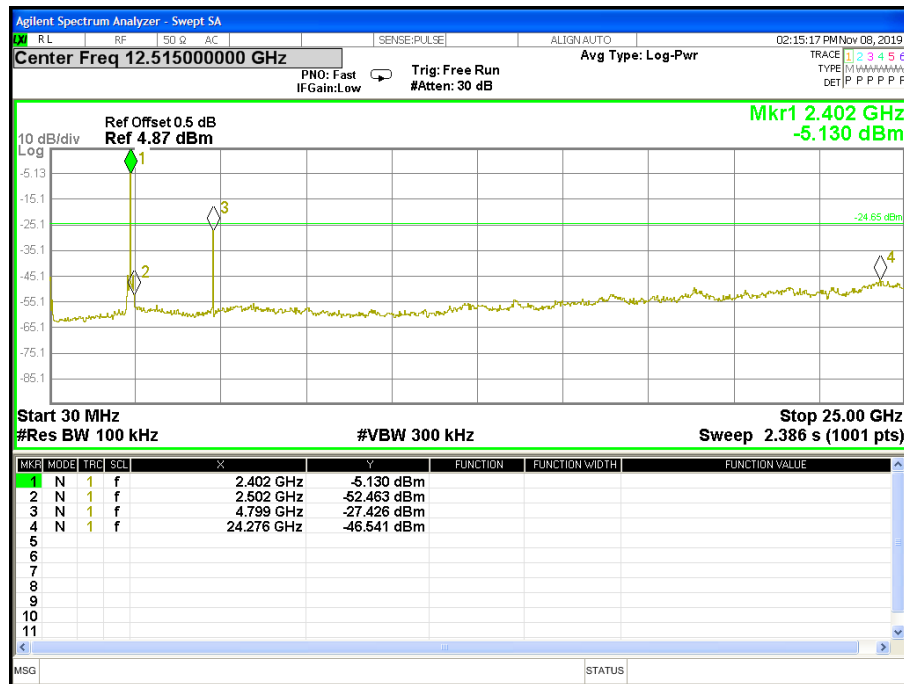
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



5.5 TEST RESULTS

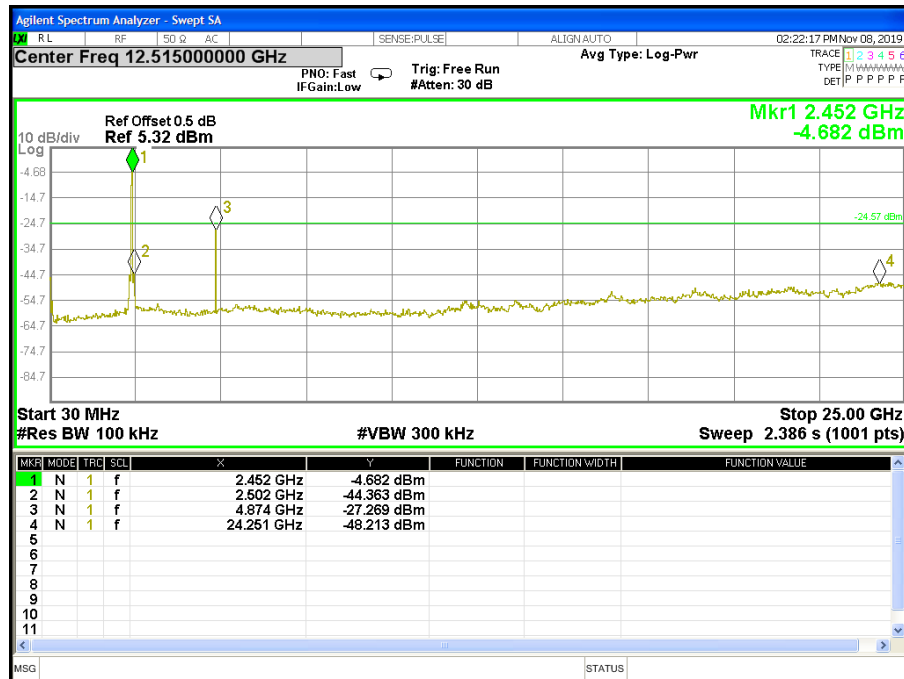
| | | | |
|---------------|----------------------|--------------------|---------------------------|
| Temperature: | 25 °C | Relative Humidity: | 50% |
| Test Voltage: | DC 3.0V from battery | Test Mode: | TX Mode /CH00, CH19, CH39 |

00 CH

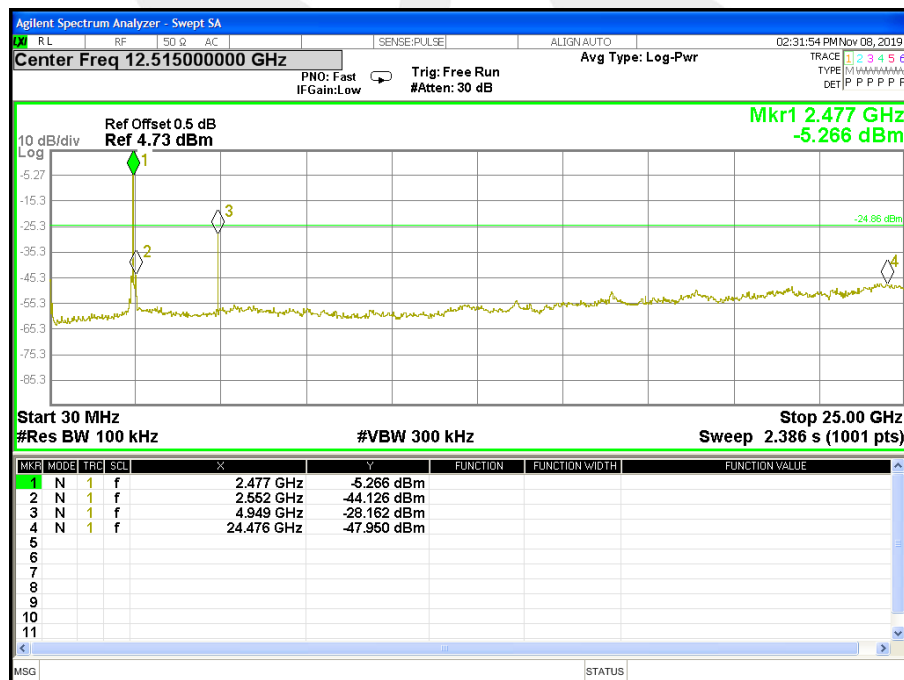




19 CH



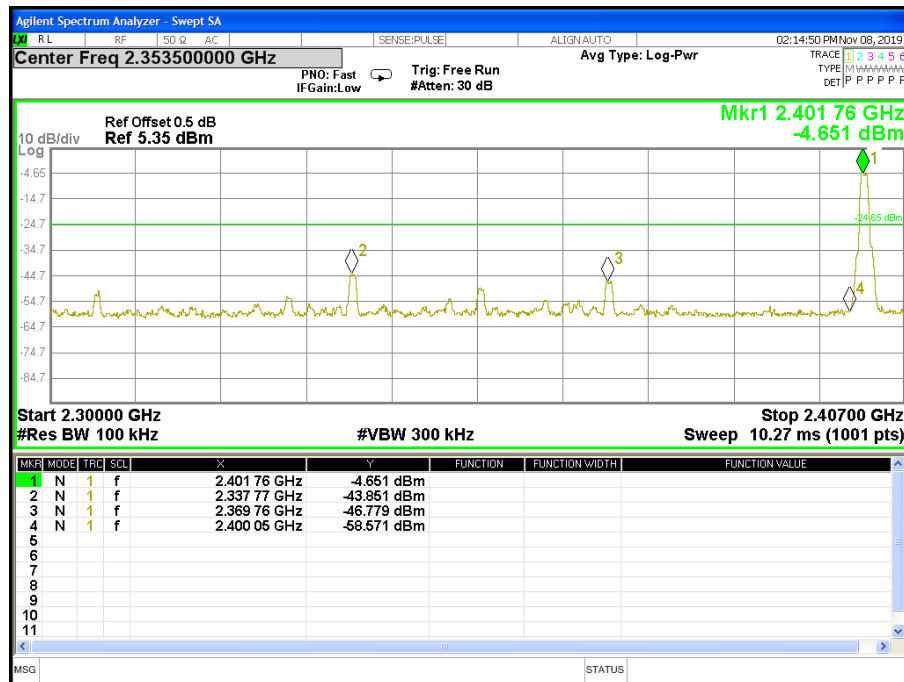
39 CH



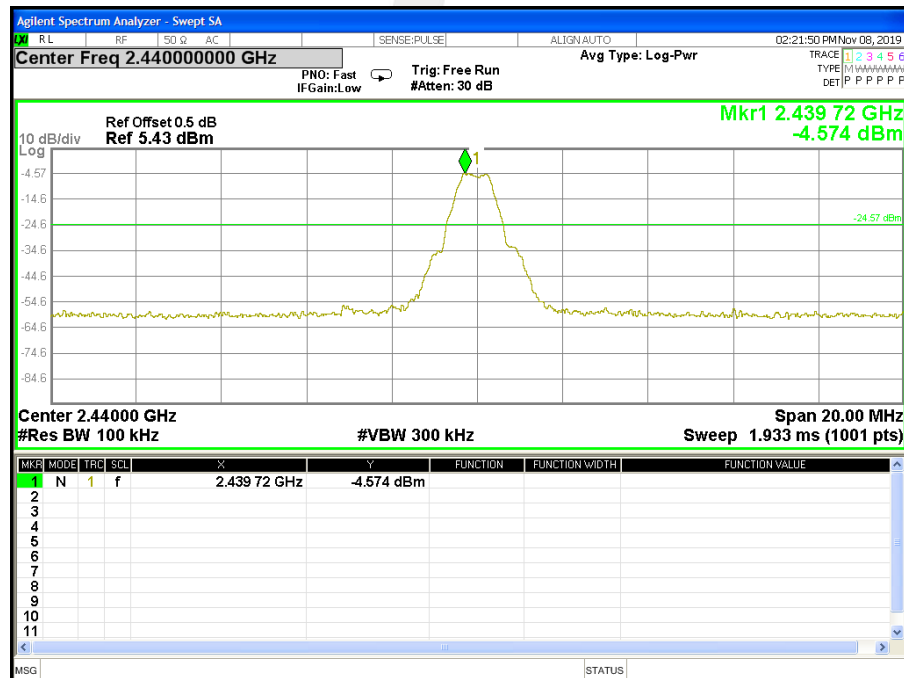


For Band edge

00 CH

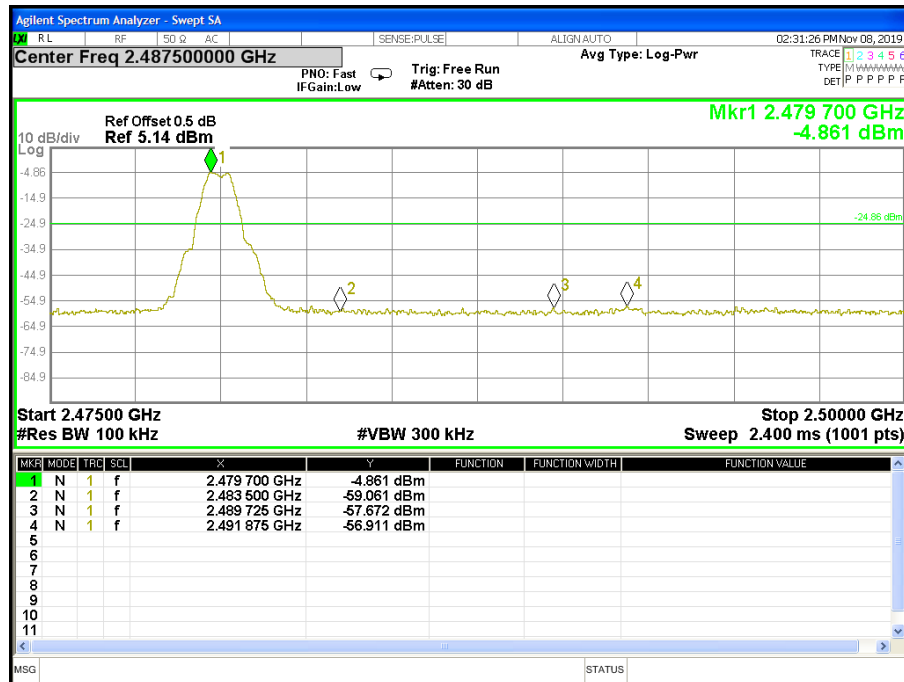


19 CH





39 CH





6. POWER SPECTRAL DENSITY TEST

6.1 LIMIT

| FCC Part 15.247, Subpart C | | | | |
|----------------------------|------------------------|------------------------------------|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(e) | Power Spectral Density | ≤ 8 dBm (RBW ≥ 3 KHz) | 2400-2483.5 | PASS |

6.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW to: $100 \text{ kHz} \geq \text{RBW} \geq 3 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

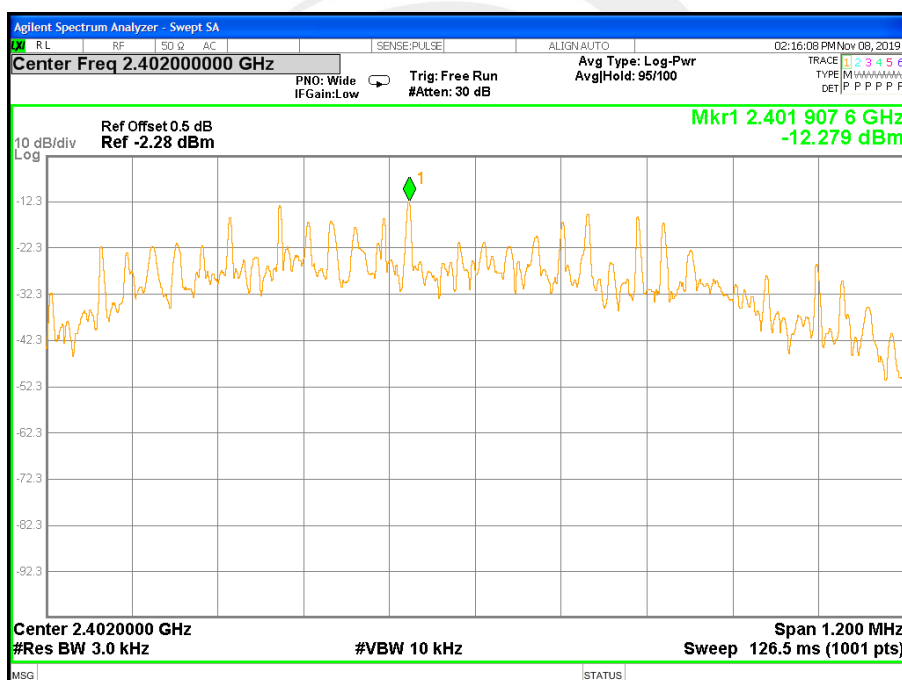


6.5 TEST RESULTS

| | | | |
|---------------|----------------------|--------------------|---------------------------|
| Temperature: | 25 °C | Relative Humidity: | 60% |
| Test Voltage: | DC 3.0V from battery | Test Mode: | TX Mode /CH00, CH19, CH39 |

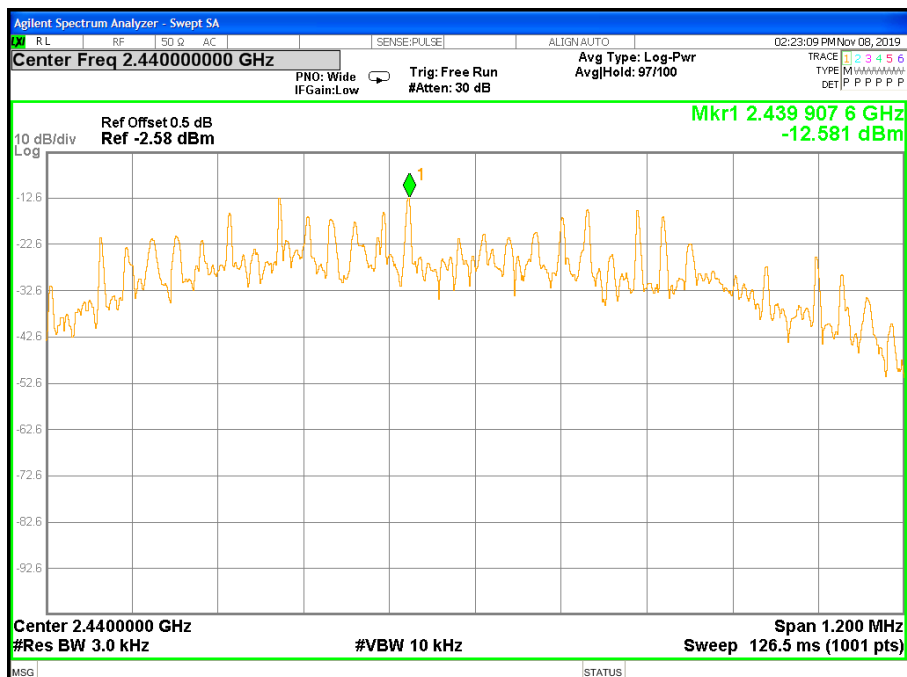
| Frequency | Power Density | Limit (dBm/3KHz) | Result |
|-----------|---------------|------------------|--------|
| | (dBm/3kHz) | | |
| 2402 MHz | -12.279 | ≤8 | PASS |
| 2440 MHz | -12.581 | ≤8 | PASS |
| 2480 MHz | -13.001 | ≤8 | PASS |

TX CH00

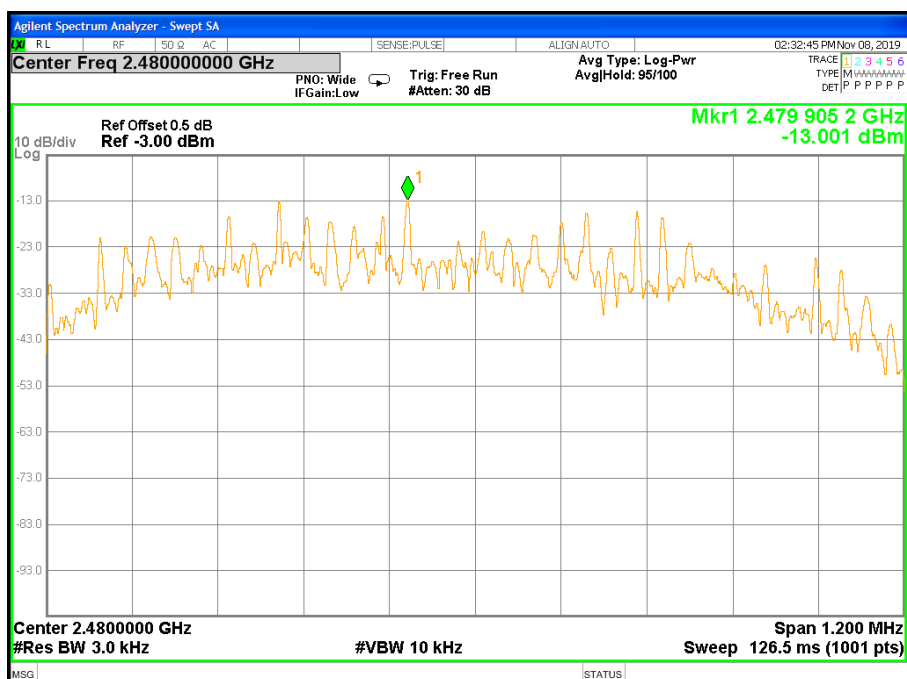




TX CH19



TX CH39





7. BANDWIDTH TEST

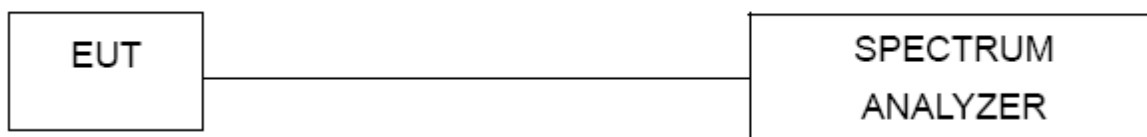
7.1 LIMIT

| FCC Part 15.247, Subpart C | | | | |
|----------------------------|-----------|---|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(a)(2) | Bandwidth | $\geq 500\text{KHz}$ (6dB bandwidth) | 2400-2483.5 | PASS |

7.2 TEST PROCEDURE

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW $\geq 3\text{RBW}$, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

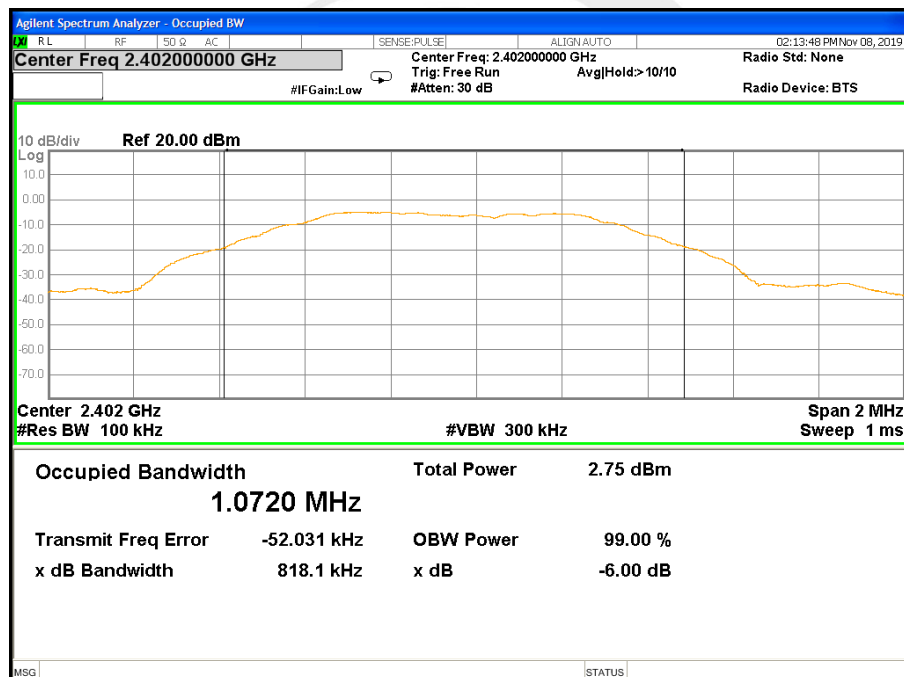


7.5 TEST RESULTS

| | | | |
|---------------|----------------------|--------------------|---------------------------|
| Temperature: | 25 °C | Relative Humidity: | 60% |
| Test Voltage: | DC 3.0V from battery | Test Mode: | TX Mode /CH00, CH19, CH39 |

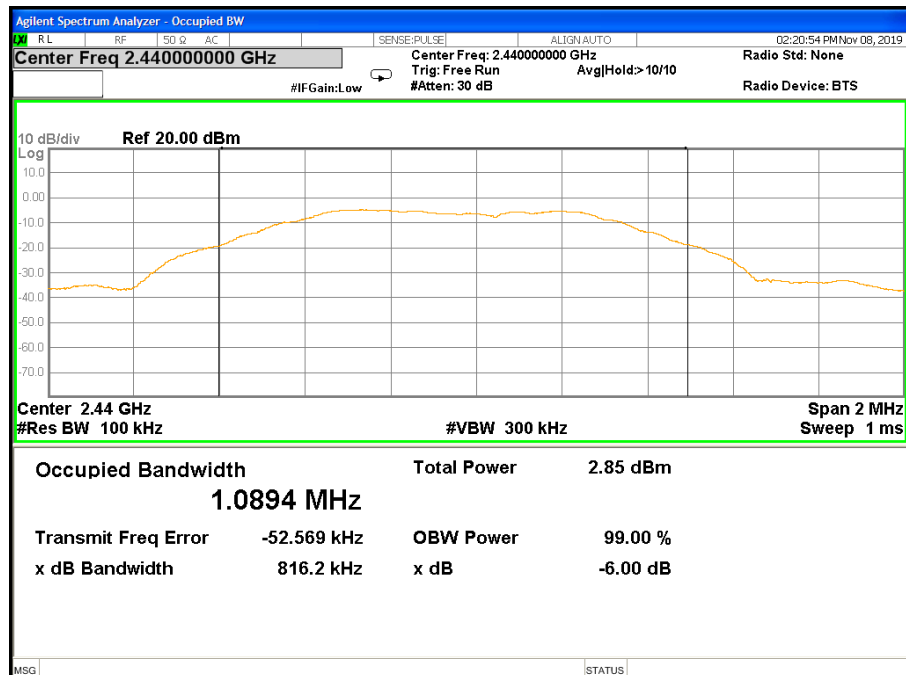
| Frequency | 6dB Bandwidth (KHz) | Channel Separation (KHz) | Result |
|-----------|---------------------|--------------------------|--------|
| 2402 MHz | 818.100 | ≥500KHz | PASS |
| 2440 MHz | 816.200 | ≥500KHz | PASS |
| 2480 MHz | 840.300 | ≥500KHz | PASS |

TX CH 00

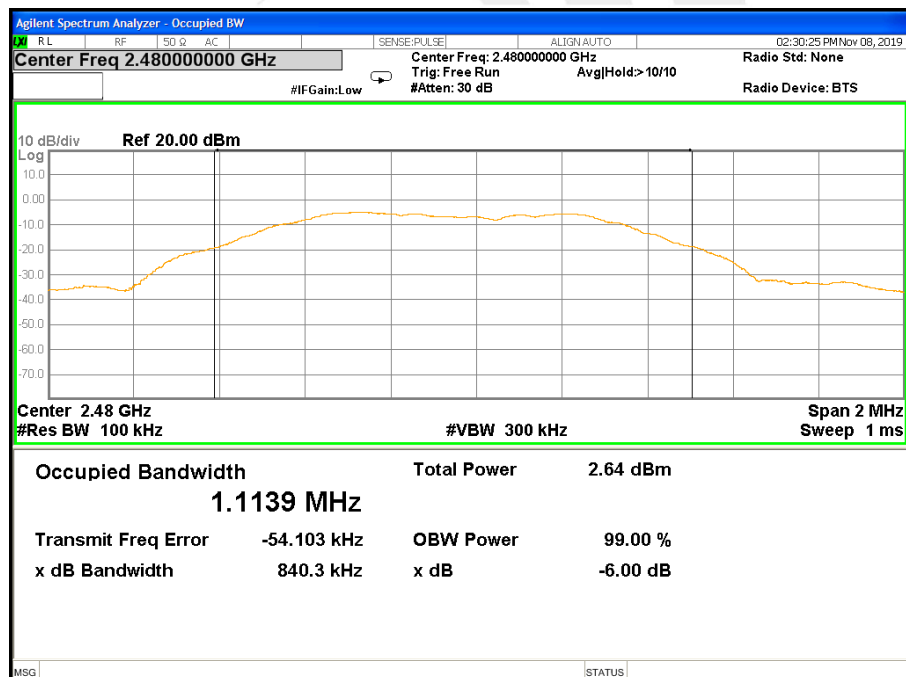




TX CH 19



TX CH 39





8. PEAK OUTPUT POWER TEST

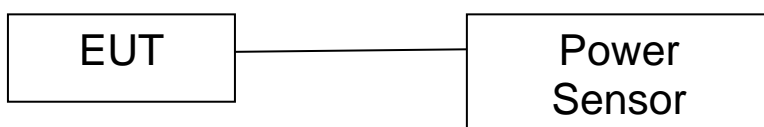
8.1 LIMIT

| FCC Part 15.247, Subpart C | | | | |
|----------------------------|--------------|-----------------|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(b)(3) | Output Power | 1 watt or 30dBm | 2400-2483.5 | PASS |

8.2 TEST PROCEDURE

- a. The EUT was directly connected to the Power Sensor&PC

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



8.5 TEST RESULTS

| | | | |
|---------------|----------------------|--------------------|---------------------------|
| Temperature: | 25 °C | Relative Humidity: | 60% |
| Test Voltage: | DC 3.0V from battery | Test Mode: | TX Mode /CH00, CH19, CH39 |

| Test Channe | Frequency | Peak Conducted Output Power | Average Conducted Output Power |
|-------------|-----------|-----------------------------|--------------------------------|
| | (MHz) | (dBm) | (dBm) |
| CH0 | 2402 | -2.39 | -2.51 |
| CH19 | 2440 | -2.51 | -2.62 |
| CH39 | 2480 | -2.70 | -2.81 |





9. ANTENNA REQUIREMENT

9.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

9.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It comply with the standard requirement.





10. EUT TEST PHOTO

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

*****END OF THE REPORT*****

