



**FCC 47 CFR PART 15 SUBPART C 15.247**

**TEST REPORT**

**FOR**

Soundbar

Model : VSB24200, BS-61, BS-61C, BS-62

Issued to

Ocean Star Electronics Ltd.

Unit 15, 8/F., Wah Wai Center, 38-40 Au Pui Wan Street Fo Tan Hong Kong

Issued by

WH Technology Corp.



|                                               |                      |                                                                                    |
|-----------------------------------------------|----------------------|------------------------------------------------------------------------------------|
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**APPENDIX 1 PHOTOS OF TEST CONFIGURATION**

**APPENDIX 2 PHOTOS OF EUT**



## 1. General Information

**Applicant** : Ocean Star Electronics Ltd.

**Address** : Unit 15, 8/F., Wah Wai Center, 38-40 Au Pui Wan Street  
Fo Tan Hong Kong

**Manufacturer** : Zhuhai Yali Technology Co., Ltd

**Address** : 8 Floors, No11, Pingdong 4th Road, Nanping Science  
and Technology Park, Zhuhai, China

**EUT** : Soundbar

**Model Name** : VSB24200,BS-61,BS-61C,BS-62

**Model Differences** : All models are identical except model name and  
appearance.

Is here with confirmed to comply with the requirements set out in the FCC Rules and Regulations Part 15 Subpart C and the measurement procedures were according to ANSI C63.10-2013. The said equipment in the configuration described in this report shows the maximum emission levels emanating

### FCC part 15 subpart C

Receipt Date : 03/19/2018

Final Test Date : 03/25/2018

**Tested By:****Reviewed by:**

Mar. 25, 2018

**Date**

Bell Wei/ Engineer

Mar. 25, 2018

**Date**Mike Lee / Manager  
Designation Number: TW1083



## 2. Report of Measurements and Examinations

### 2.1 List of Measurements and Examinations

| FCC Rule                       | Description of Test                                                                                         | Result |
|--------------------------------|-------------------------------------------------------------------------------------------------------------|--------|
| Maximum Peak Output Power      | FCC Part 15: 15.247(b)(1)<br>ANSI C63.4 :2014&RSS-247 5.4(2) &<br>ANSI C63.10 :2013                         | Pass   |
| Bandwidth                      | FCC Part 15: 15.215<br>ANSI C63.4 :2014&RSS-247 5.1(2) &<br>ANSI C63.10 :2013                               | Pass   |
| Carrier Frequency Separation   | FCC Part 15: 15.247(a)(1) ANSI<br>C63.4 :2014&<br>RSS-247 5.1(2) & ANSI C63.10 :2013                        | Pass   |
| Number Of Hopping Channel      | FCC Part 15: 15.247(a)(1)(iii) ANSI<br>C63.4 :2014&RSS-247 5.1(4) &<br>ANSI C63.10 :2013                    | Pass   |
| Dwell Time                     | FCC Part 15: 15.247(a)(1)(iii) ANSI<br>C63.4 :2014&RSS-247 5.1(4) &<br>ANSI C63.10 :2013                    | Pass   |
| Radiated Emission              | FCC Part 15: 15.209<br>FCC Part 15: 15.247(d)<br>ANSI C63.4 :2014&RSS-247 Section<br>5.5& ANSI C63.10 :2013 | Pass   |
| Band Edge Compliance           | FCC Part 15: 15.247(d)<br>ANSI C63.4 :2014&RSS-247 Section<br>5.5& ANSI C63.10 :2013                        | Pass   |
| Power Line Conducted Emissions | FCC Part 15: 15.207<br>ANSI C63.4 :2014&IC RSS Gen, Section<br>7.2.4& ANSI C63.10 :2013                     | Pass   |
| Antenna requirement            | 15: 15.203 &IC RSS Gen, Section 7.1.4                                                                       | Pass   |



### 3. Test Configuration of Equipment under Test

#### 3.1 Description of the tested samples

EUT Name : Soundbar

Model Number : VSB24200

FCCID : LMZ-VSB24200

Receipt Date : 03/19/2018

Power From : ☐ Inside ☒ Outside  
☒ Adaptor ☐ Battery ☐ AC Power Source  
☐ DC Power Source ☐ Support Unit PC or NB

Operate Frequency : Refer to the channel list as described below (2.402 ~2.480 GHz)

Modulation Technique : GFSK, $\pi$ /4DQPSK,8DPSK

Number of Channels : 79

Channel spacing : ☐ N/A ☒ 1 MHz

Operating Mode : ☒ Simplex ☐ Half Duplex

Bluetooth version : V4.2

Antenna Type : PCB Antenna

Antenna gain : 0 dBi



### 3.2 Carrier Frequency of Channels

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 00      | 2402            | 27      | 2429            | 54      | 2456            |
| 01      | 2403            | 28      | 2430            | 55      | 2457            |
| 02      | 2404            | 29      | 2431            | 56      | 2458            |
| 03      | 2405            | 30      | 2432            | 57      | 2459            |
| 04      | 2406            | 31      | 2433            | 58      | 2460            |
| 05      | 2407            | 32      | 2434            | 59      | 2461            |
| 06      | 2408            | 33      | 2435            | 60      | 2462            |
| 07      | 2409            | 34      | 2436            | 61      | 2463            |
| 08      | 2410            | 35      | 2437            | 62      | 2464            |
| 09      | 2411            | 36      | 2438            | 63      | 2465            |
| 10      | 2412            | 37      | 2439            | 64      | 2466            |
| 11      | 2413            | 38      | 2440            | 65      | 2467            |
| 12      | 2414            | 39      | 2441            | 66      | 2468            |
| 13      | 2415            | 40      | 2442            | 67      | 2469            |
| 14      | 2416            | 41      | 2443            | 68      | 2470            |
| 15      | 2417            | 42      | 2444            | 69      | 2471            |
| 16      | 2418            | 43      | 2445            | 70      | 2472            |
| 17      | 2419            | 44      | 2446            | 71      | 2473            |
| 18      | 2420            | 45      | 2447            | 72      | 2474            |
| 19      | 2421            | 46      | 2448            | 73      | 2475            |
| 20      | 2422            | 47      | 2449            | 74      | 2476            |
| 21      | 2423            | 48      | 2450            | 75      | 2477            |
| 22      | 2424            | 49      | 2451            | 76      | 2478            |
| 23      | 2425            | 50      | 2452            | 77      | 2479            |
| 24      | 2426            | 51      | 2453            | 78      | 2480            |
| 25      | 2427            | 52      | 2454            | --      | --              |
| 26      | 2428            | 53      | 2455            | --      | --              |



### **3.3 Test Mode and Test Software**

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- b. The complete test system included Notebook and EUT for RF test.
- c. Test Software: Radio Test.exe
- d. New Battery was used for all testing and the worst radiated emission case from X,Y and Z axis evaluation was selected for testing.
- e. The following test modes were performed for test:
  - BT: CH00: 2402MHz, CH38: 2440MHz, CH78: 2480MHz



### **3.4 TEST Methodology & General Test Procedures**

All testing as described bellowed were performed in accordance with ANSI C63.4:2014 and ANSI C63.10:2013.

#### **Conducted Emissions**

The EUT is placed on a wood table, which is at 0.8 m above ground plane acceding to clause 15.207 and requirements of ANSI C63.4:2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz are using CISPR Quasi-Peak / Average detectors.

#### **Radiated Emissions**

The EUT is a placed on a turn table, which is 0.8 m above ground plane. The turntable was rotated through 360 degrees to determine the position of maximum emission level. The EUT is placed at 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

- 1) Putting the EUT on the platform and turning on the EUT (on/off button on the bottom of the EUT).
- 2) Setting test channel described as “Channel setting and operating condition”, and testing channel by channel.
- 3) For the maximum output power measurement, we followed the method of measurement KDB558074 D01.
- 4) For the spurious emission test based on ANSI(2014), at the frequency where below 1GHz used quasi-peak detector mode; where above 1GHz used the peak and average detector mode. IF the peak value may be under average limit, the average mode will not be performed.



### 3.5 Measurement Uncertainty

| Measurement Item             | Uncertainty          |
|------------------------------|----------------------|
| Peak Output Power(conducted) | $\pm 1.345\text{dB}$ |
| Power Spectral Density       | $\pm 1.347\text{dB}$ |
| Radiated emission(1G-25GHz)  | $\pm 5.00\text{dB}$  |
| Radiated emission(30M-1GHz)  | $\pm 3.89\text{dB}$  |
| Conducted emission           | $\pm 1.81\text{dB}$  |

### 3.6 Description of the Support Equipments

#### Setup Diagram

See test photographs attached in appendix 1 for the actual connections between EUT and support equipment.

#### Support Equipment

Peripherals Devices:

| OUTSIDE SUPPORT EQUIPMENT |           |       |            |                    |               |            |            |
|---------------------------|-----------|-------|------------|--------------------|---------------|------------|------------|
| No.                       | Equipment | Model | Serial No. | FCC ID/<br>BSMI ID | Trade<br>name | Data Cable | Power Cord |
| 1.                        | N/A       | N/A   | N/A        | N/A                | N/A           | N/A        | N/A        |
| INSIDE SUPPORT EQUIPMENT  |           |       |            |                    |               |            |            |
| No.                       | Equipment | Model | Serial No. | FCC ID/<br>BSMI ID | Trade<br>name | Data Cable | Power Cord |
| 1.                        | N/A       | N/A   | N/A        | N/A                | N/A           | N/A        | N/A        |

**Note:** All the above equipment /cable were placed in worse case position to maximize emission signals during emission test

**Grounding:** Grounding was in accordance with the manufacturer's requirement and conditions for the intended use.



## **4. Test and measurement equipment**

### **4.1 calibration**

The measuring equipment utilized to perform the tests documented in the report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### **4.2 equipment**

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and. Other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.

**TABLELIST OF TEST AND MEASUREMENT EQUIPMENT**

| Test Site  | Instrument                                | Manufacturer                          | Model No.               | S/N                      | Next Cal. Date |
|------------|-------------------------------------------|---------------------------------------|-------------------------|--------------------------|----------------|
| Conduction | Spectrum (9K--3GHz)                       | R&S                                   | FSP3                    | 833387/010               | 2018/09/20     |
|            | EMI Receiver                              | R&S                                   | ESHS10                  | 830223/008               | 2018/05/22     |
|            | LISN                                      | Rolf Heine<br>Hochfrequenztech<br>nik | NNB-2/16z               | 98062                    | 2018/05/25     |
|            | ISN                                       | Schwarzbeck                           | 8-Wire ISN<br>CAT5      | CAT5-8158-009<br>4       | 2018/09/21     |
|            | RF Cable                                  | N/A                                   | N/A                     | EMI-3                    | 2018/10/19     |
| Radiation  | Bilog antenna(30M-1 G)                    | ETC                                   | MCTD2786B               | BLB16M04004<br>/JB-5-004 | 2018/05/03     |
|            | Double Ridged Guide Horn antenna(1G-18 G) | ETC                                   | MCTD 1209               | DRH15N0<br>2009          | 2018/11/23     |
|            | Horn antenna (18G-26G)                    | com-power                             | AH-826                  | 81000                    | 2018/08/15     |
|            | LOOP Antenna (Below 30M)                  | com-power                             | AL-130                  | 17117                    | 2018/10/04     |
|            | Pre amplifier (30M-1G)                    | EMC<br>INSTRUMENT                     | EMC9135                 | 980334                   | 2018/05/04     |
|            | Microwave Preamplifier (1G-18G)           | EMC<br>INSTRUMENT                     | EMC051845               | 980108&AT<br>-18001      | 2018/10/23     |
|            | Pre amplifier (18G~26G)                   | MITEQ                                 | JS4-18002600-3<br>0-5A  | 808329                   | 2018/08/10     |
|            | EMI Test Receiver                         | R&S                                   | ESVS30<br>(20M-1000MHz) | 826006/002               | 2018/11/28     |
|            | RF Cable                                  | EMCI                                  | N male on end           | 30m                      | 2018/10/19     |



|                              |                         |                       |                            |            |            |
|------------------------------|-------------------------|-----------------------|----------------------------|------------|------------|
|                              | (open site)             |                       | of<br>both sides<br>(EMI4) |            |            |
|                              | RF CABLE<br>(1~26.5G)   | HARBOUT<br>INDUSTRIES | LL142MI(4M+4M)             | NA         | 2019/03/08 |
|                              | RF CABLE<br>(1~26.5G)   | HARBOUR<br>INDUSTRIES | LL142MI(7M)                | NA         | 2018/08/11 |
|                              | Spectrum<br>(9K--7GHz)  | R&S                   | FSP7                       | 830180/006 | 2018/03/25 |
|                              | Spectrum<br>(9K--40GHz) | AGILENT               | 8564EC                     | 4046A0032  | 2019/03/01 |
| Conducted<br>Output<br>Power | Power Meter<br>40MHz    | Anritsu               | ML2495A                    | N/A        | 2018/10/23 |
|                              | Power sensor<br>40MHz   | Anritsu               | MA2411B                    | N/A        | 2018/10/23 |
| Software                     | e3                      | AUDIX                 | N/A                        | N/A        | N/A        |

**\*CALIBRATION INTERVAL OF INSTRUMENTS LISTED ABOVE IS ONE YEAR**



## **5. Antenna Requirements**

### **5.1 Standard Applicable**

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **5.2 Antenna Construction and Directional Gain**

Antenna Type: PCB Antenna

Antenna Gain: 0 dBi



## 6. Test of Conducted Emission

### 6.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 110 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2014 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

| Frequency<br>(MHz) | Quasi Peak<br>(dB $\mu$ V) | Average<br>(dB $\mu$ V) |
|--------------------|----------------------------|-------------------------|
| 0.15 – 0.5         | 66-56*                     | 56-46*                  |
| 0.5 – 5.0          | 56                         | 46                      |
| 5.0 – 30.0         | 60                         | 50                      |

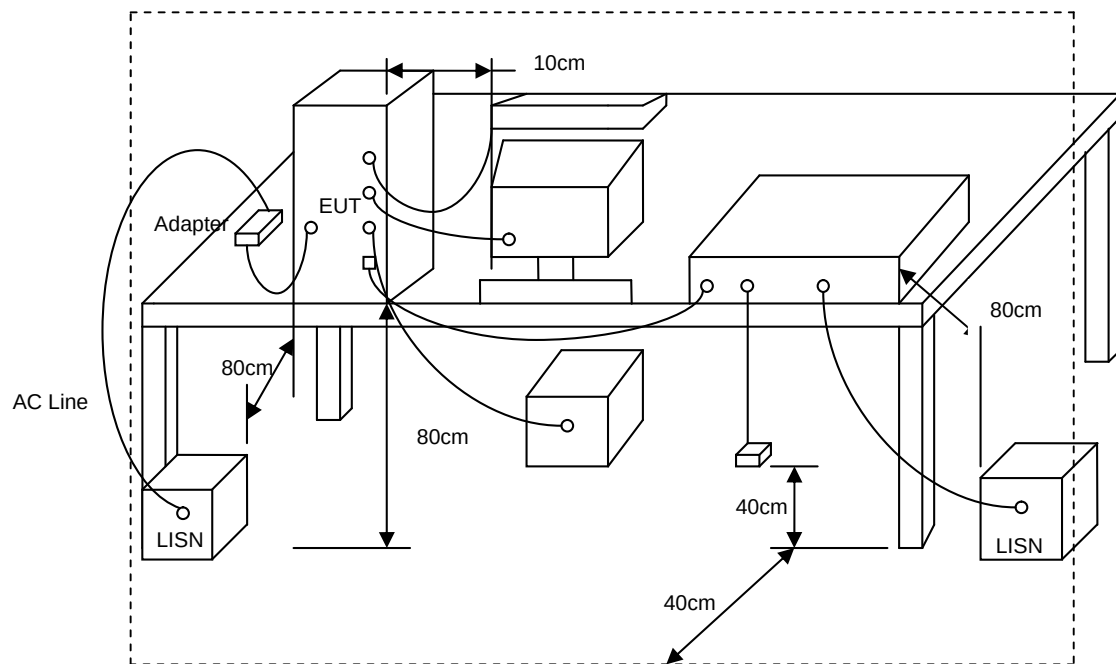
\*Decreases with the logarithm of the frequency.

### 6.2 Test Procedures

- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



### 6.3 Typical Test Setup

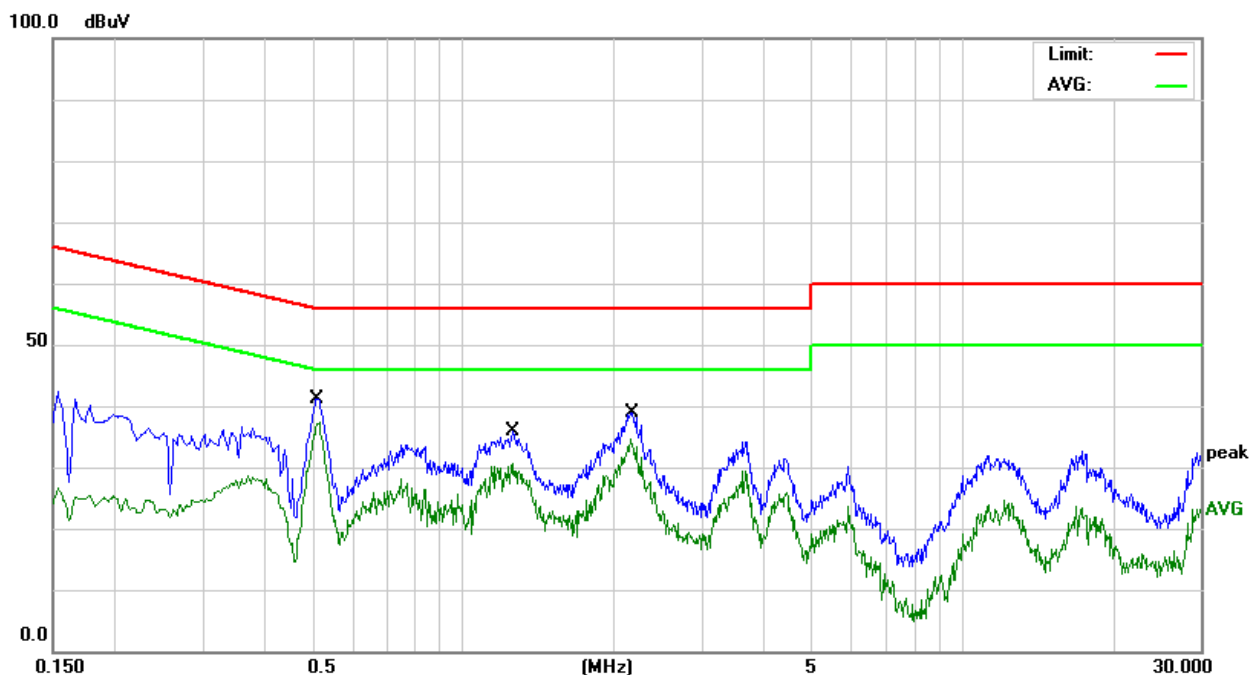




## 6.4 Test Result and Data

|             |   |                                   |             |   |       |
|-------------|---|-----------------------------------|-------------|---|-------|
| Power       | : | DC 5V1.5A by adapter AC 120V/60Hz | Pol/Phase   | : | L     |
| Test Mode 1 | : | TX CH39                           | Temperature | : | 30 °C |
| Memo        | : | /                                 | Humidity    | : | 59%   |

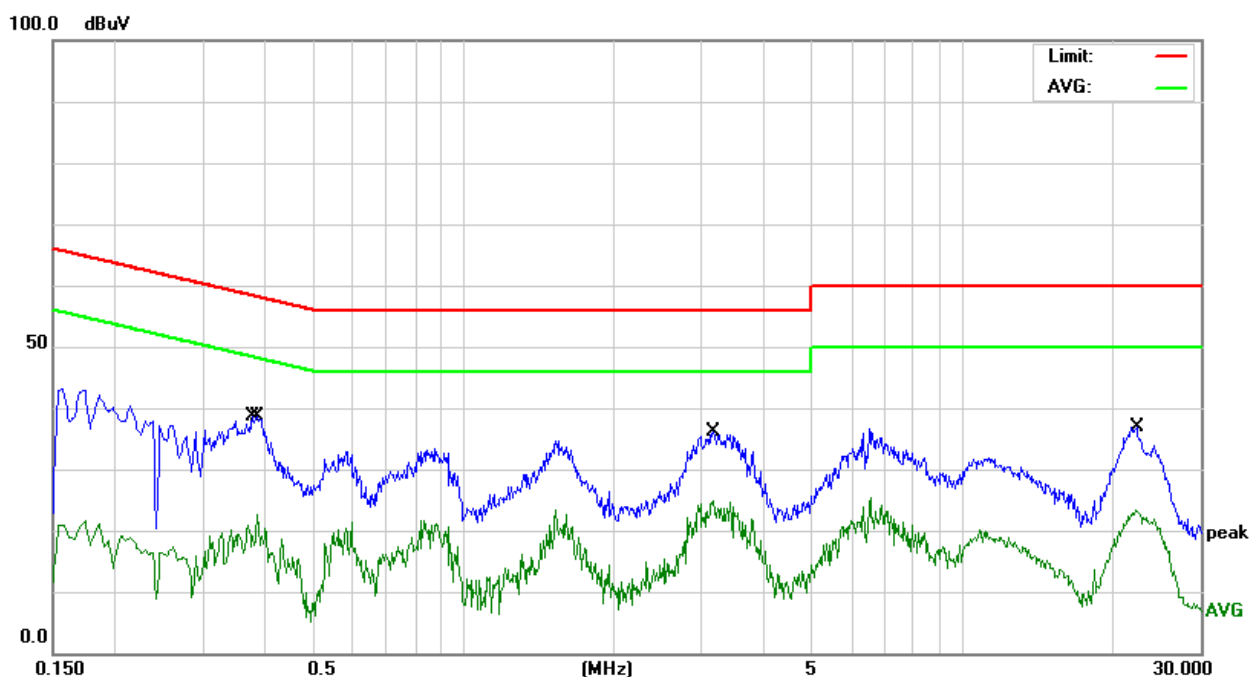
| No. | Mk. | Freq.  | Reading Level | Correct Factor | Measurement | Limit | Over   |          |         |
|-----|-----|--------|---------------|----------------|-------------|-------|--------|----------|---------|
|     |     | MHz    | dBuV          | dB             | dBuV        | dBuV  | dB     | Detector | Comment |
| 1   |     | 0.5100 | 31.22         | 10.01          | 41.23       | 56.00 | -14.77 | QP       |         |
| 2   | *   | 0.5140 | 27.25         | 10.01          | 37.26       | 46.00 | -8.74  | AVG      |         |
| 3   |     | 1.2579 | 25.85         | 9.95           | 35.80       | 56.00 | -20.20 | QP       |         |
| 4   |     | 1.2579 | 20.68         | 9.95           | 30.63       | 46.00 | -15.37 | AVG      |         |
| 5   |     | 2.1580 | 24.53         | 10.00          | 34.53       | 46.00 | -11.47 | AVG      |         |
| 6   |     | 2.1860 | 28.90         | 10.00          | 38.90       | 56.00 | -17.10 | QP       |         |





|             |   |                                   |             |   |       |
|-------------|---|-----------------------------------|-------------|---|-------|
| Power       | : | DC 5V1.5A by adapter AC 120V/60Hz | Pol/Phase   | : | N     |
| Test Mode 1 | : | TX CH39                           | Temperature | : | 30 °C |
| Memo        | : |                                   | Humidity    | : | 59%   |

| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measurement | Limit | Over   | Detector | Comment |
|-----|-----|---------|---------------|----------------|-------------|-------|--------|----------|---------|
|     |     | MHz     | dBuV          | dB             | dBuV        | dBuV  | dB     |          |         |
| 1   | *   | 0.3780  | 28.56         | 10.14          | 38.70       | 58.32 | -19.62 | QP       |         |
| 2   |     | 0.3860  | 12.38         | 10.13          | 22.51       | 48.15 | -25.64 | AVG      |         |
| 3   |     | 3.1580  | 26.01         | 10.04          | 36.05       | 56.00 | -19.95 | QP       |         |
| 4   |     | 3.1580  | 14.83         | 10.04          | 24.87       | 46.00 | -21.13 | AVG      |         |
| 5   |     | 22.2380 | 12.19         | 11.15          | 23.34       | 50.00 | -26.66 | AVG      |         |
| 6   |     | 22.4140 | 25.80         | 11.16          | 36.96       | 60.00 | -23.04 | QP       |         |





## 7. Test of Radiated Emission

### 7.1 Test Limit

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. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

| Frequency (MHz) | Field Strength (microvolt/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                             |

### 7.2 Test Procedures

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in

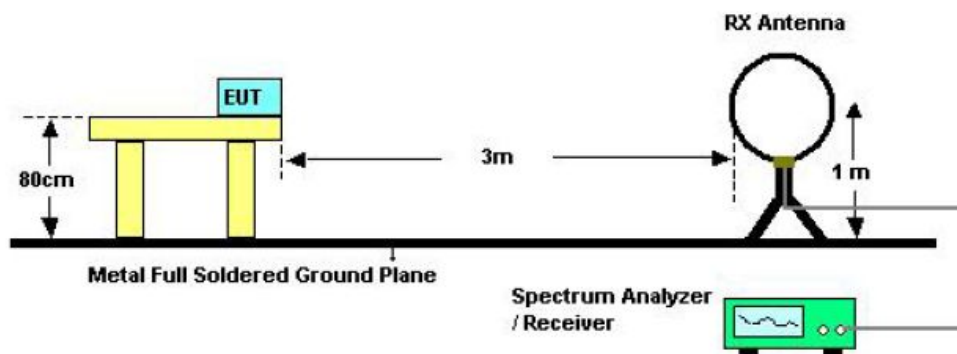


average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

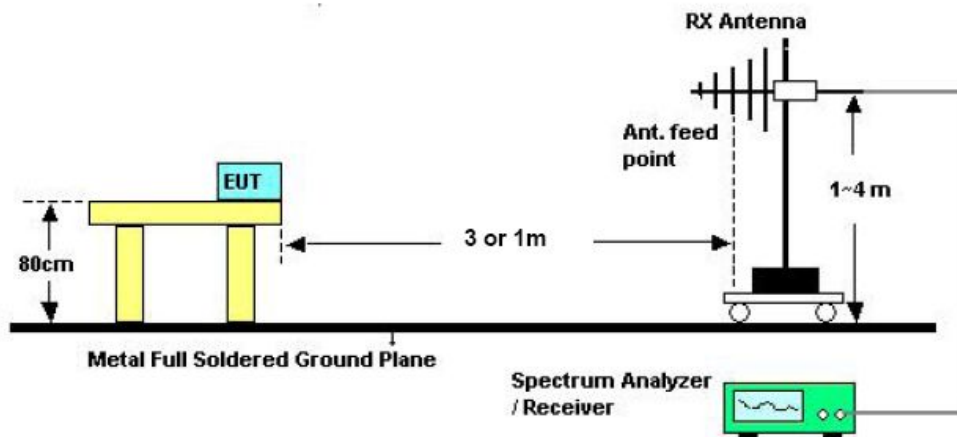
- i. "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.

## 7.3 Typical Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



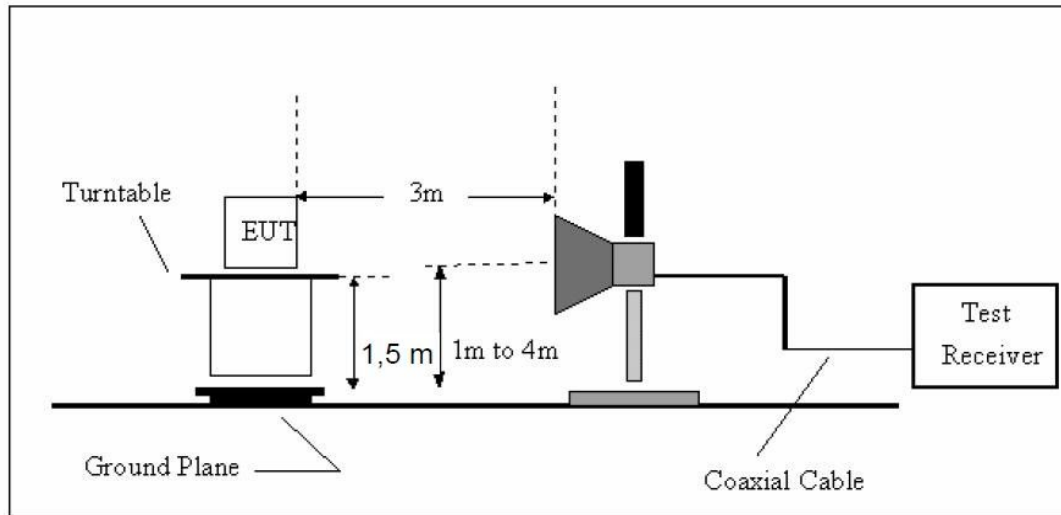
Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor =  $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].



For radiated emissions frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

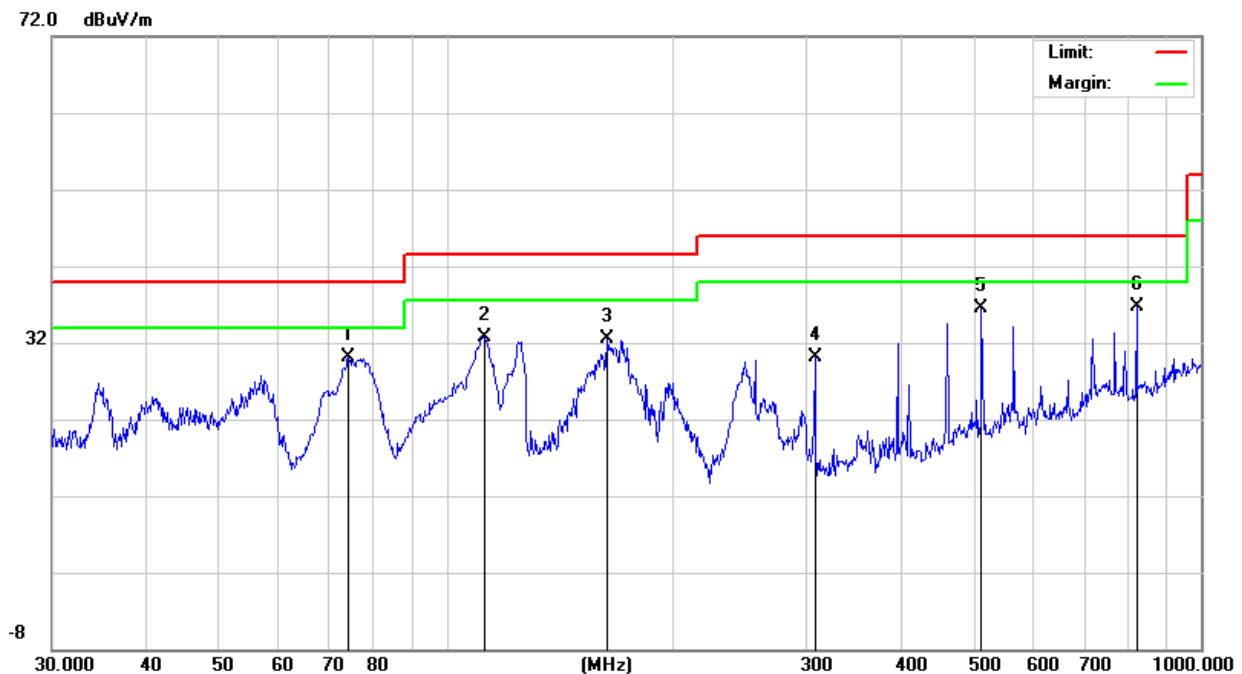


#### 7.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

#### 7.5 Test Result and Data (30MHz ~ 1GHz, worst emissions found)

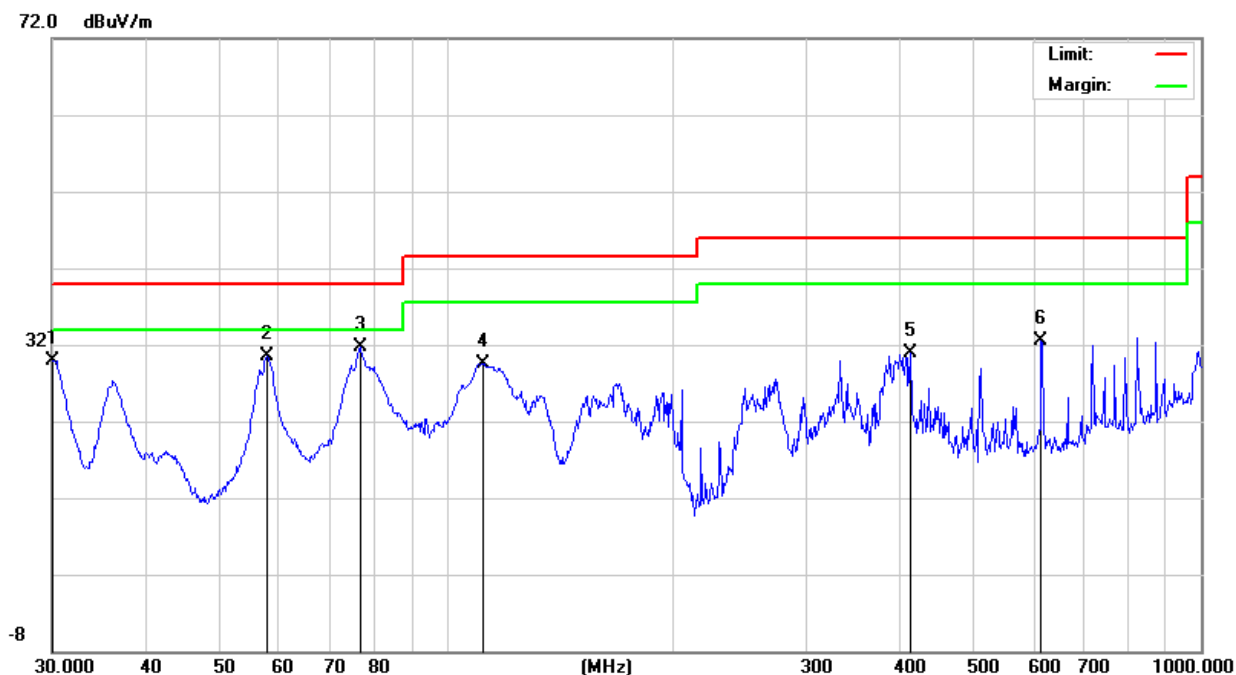
|             |   |                                   |             |   |            |
|-------------|---|-----------------------------------|-------------|---|------------|
| Power       | : | DC 5V1.5A by adapter AC 120V/60Hz | Pol/Phase   | : | HORIZONTAL |
| Test Mode 1 | : | TX CH38                           | Temperature | : | 30 °C      |
| Memo        | : | /                                 | Humidity    | : | 59%        |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   | Antenna Height | Table Degree |        |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|--------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector       | cm           | degree |
| 1   |     | 74.1350  | 23.37         | 6.69           | 30.06       | 40.00  | -9.94  | QP             |              |        |
| 2   |     | 112.1303 | 20.99         | 11.77          | 32.76       | 43.50  | -10.74 | QP             |              |        |
| 3   |     | 163.1818 | 21.56         | 10.89          | 32.45       | 43.50  | -11.05 | QP             |              |        |
| 4   |     | 307.8312 | 15.11         | 14.98          | 30.09       | 46.00  | -15.91 | QP             |              |        |
| 5   |     | 511.8351 | 15.67         | 20.78          | 36.45       | 46.00  | -9.55  | QP             |              |        |
| 6   | *   | 821.7103 | 9.96          | 26.70          | 36.66       | 46.00  | -9.34  | QP             |              |        |



|             |   |                                   |             |   |          |
|-------------|---|-----------------------------------|-------------|---|----------|
| Power       | : | DC 5V1.5A by adapter AC 120V/60Hz | Pol/Phase   | : | VERTICAL |
| Test Mode 1 | : | TX CH38                           | Temperature | : | 30 °C    |
| Memo        | : | /                                 | Humidity    | : | 59%      |

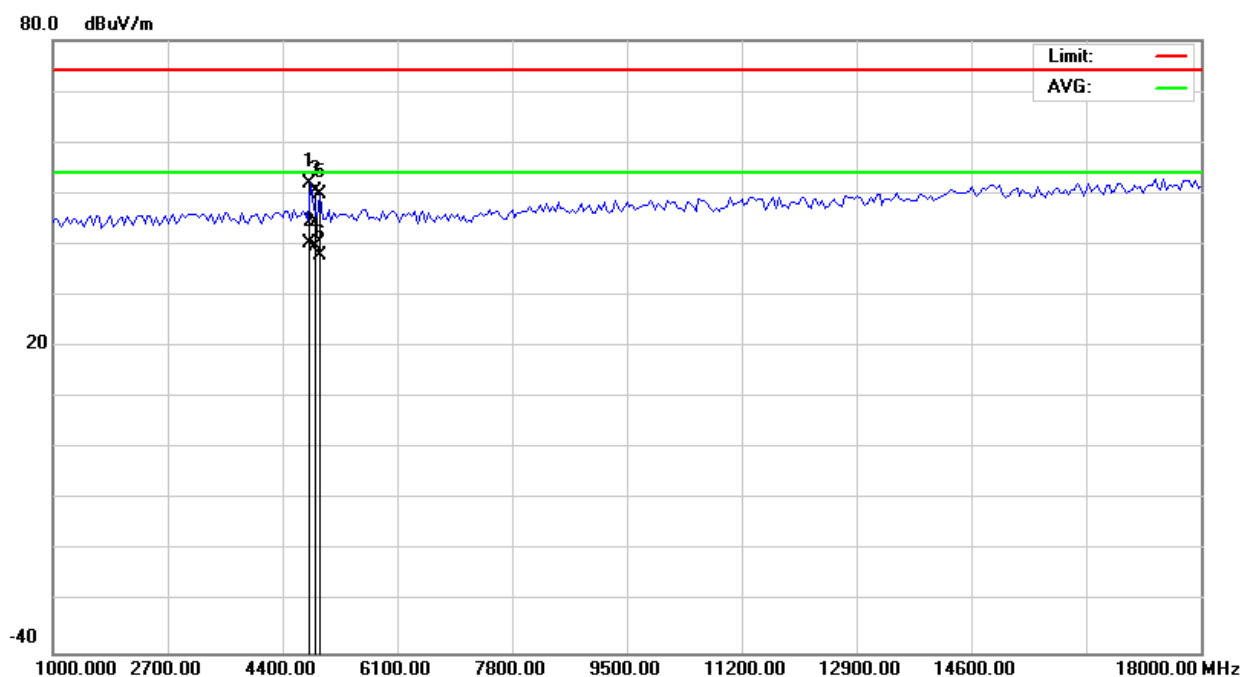


| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit  | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dBuV/m | dB     | cm             | degree       | Comment |
| 1   |     | 30.1051  | 11.69         | 18.28          | 29.97        | 40.00  | -10.03 | QP             |              |         |
| 2   |     | 57.7961  | 24.81         | 5.63           | 30.44        | 40.00  | -9.56  | QP             |              |         |
| 3   | *   | 76.7806  | 24.60         | 7.14           | 31.74        | 40.00  | -8.26  | QP             |              |         |
| 4   |     | 111.7377 | 17.77         | 11.74          | 29.51        | 43.50  | -13.99 | QP             |              |         |
| 5   |     | 411.8240 | 12.20         | 18.80          | 31.00        | 46.00  | -15.00 | QP             |              |         |
| 6   |     | 614.2142 | 9.04          | 23.48          | 32.52        | 46.00  | -13.48 | QP             |              |         |



## 7.6 Test Result and Data (Above 1GHz)

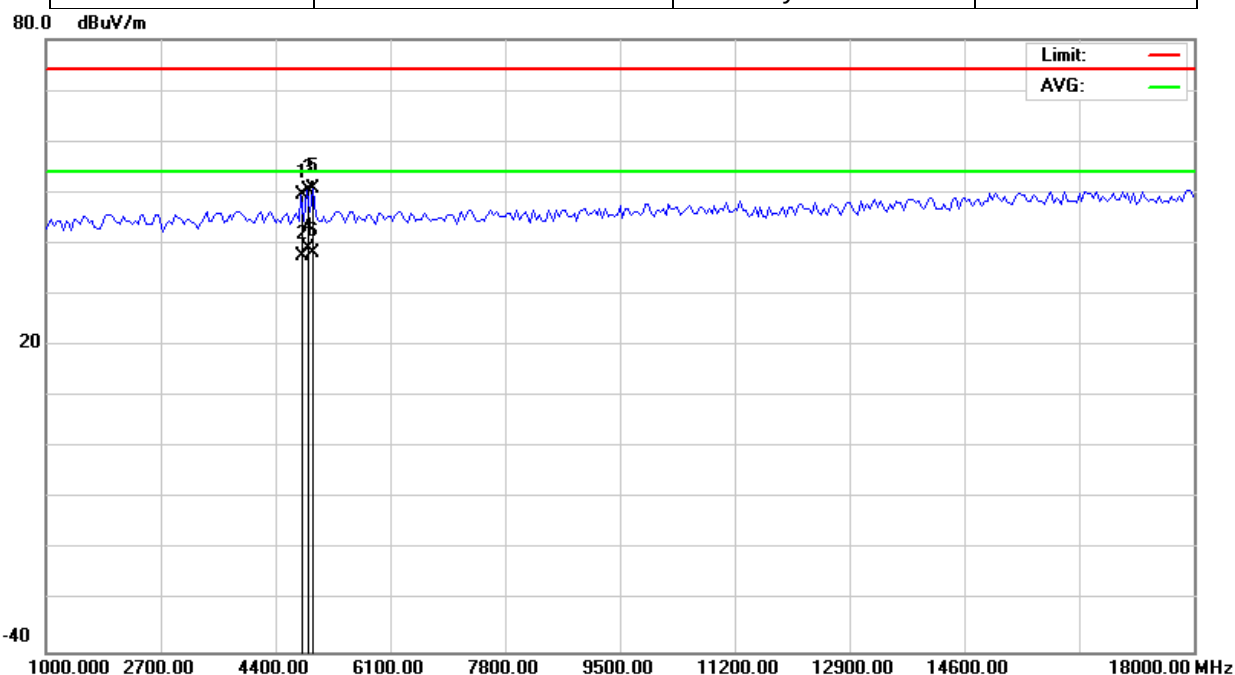
|             |   |                                   |             |   |            |
|-------------|---|-----------------------------------|-------------|---|------------|
| Power       | : | DC 5V1.5A by adapter AC 120V/60Hz | Pol/Phase   | : | HORIZONTAL |
| Test Mode 1 | : | TX CH0,CH38,CH78                  | Temperature | : | 30 °C      |
| Memo        | : | /                                 | Humidity    | : | 59 %       |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit  | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dBuV/m | dB     | cm             | degree       | Comment |
| 1   |     | 4804.000 | 43.88         | 8.12           | 52.00        | 74.00  | -22.00 | QP             |              |         |
| 2   | *   | 4804.000 | 32.00         | 8.12           | 40.12        | 54.00  | -13.88 | AVG            |              |         |
| 3   |     | 4880.000 | 42.23         | 8.17           | 50.40        | 74.00  | -23.60 | QP             |              |         |
| 4   |     | 4880.000 | 31.46         | 8.17           | 39.63        | 54.00  | -14.37 | AVG            |              |         |
| 5   |     | 4960.000 | 41.69         | 8.21           | 49.90        | 74.00  | -24.10 | QP             |              |         |
| 6   |     | 4960.000 | 29.70         | 8.21           | 37.91        | 54.00  | -16.09 | AVG            |              |         |



|             |   |                                   |             |   |          |
|-------------|---|-----------------------------------|-------------|---|----------|
| Power       | : | DC 5V1.5A by adapter AC 120V/60Hz | Pol/Phase   | : | VERTICAL |
| Test Mode 1 | : | TX CH0,CH38,CH78                  | Temperature | : | 30 °C    |
| Memo        | : |                                   | Humidity    | : | 59 %     |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   | Antenna Height | Table Degree |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | cm             | degree       | Comment |
| 1   |     | 4804.000 | 41.38         | 8.12           | 49.50       | 74.00  | -24.50 | QP             |              |         |
| 2   |     | 4804.000 | 29.52         | 8.12           | 37.64       | 54.00  | -16.36 | AVG            |              |         |
| 3   |     | 4880.000 | 42.23         | 8.17           | 50.40       | 74.00  | -23.60 | QP             |              |         |
| 4   | *   | 4880.000 | 30.85         | 8.17           | 39.02       | 54.00  | -14.98 | AVG            |              |         |
| 5   |     | 4960.000 | 42.59         | 8.21           | 50.80       | 74.00  | -23.20 | QP             |              |         |
| 6   |     | 4960.000 | 29.95         | 8.21           | 38.16       | 54.00  | -15.84 | AVG            |              |         |

**7.7 Restrict Band Emission Measurement Data**

## Radiated Method

|             |   |                                   |             |   |       |
|-------------|---|-----------------------------------|-------------|---|-------|
| Power       | : | DC 5V1.5A by adapter AC 120V/60Hz | Pol/Phase   | : | H/V   |
| Test Mode 1 | : | GFSK / $\pi/4$ DQPSK / 8- DPSK    | Temperature | : | 30 °C |
| Test Date   | : | Mar. 19, 2018                     | Humidity    | : | 59 %  |

## GFSK

| Channel 0       |             |                      |                       |                 |        | Fundamental Frequency: 2402 MHz |     |             |            |              |
|-----------------|-------------|----------------------|-----------------------|-----------------|--------|---------------------------------|-----|-------------|------------|--------------|
| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result (dBuV/m) | Remark | Limit (dBuV/m)                  |     | Margin (dB) | Table Deg. | Ant High (m) |
|                 |             |                      |                       |                 |        | Peak                            | Ave |             |            |              |
| 2390.00         | H           | 56.24                | -13.99                | 42.25           | Peak   | 74                              | 54  | -31.75      | 138        | 1.5          |
| ---             | H           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |
| 2390.00         | V           | 58.31                | -13.99                | 44.32           | Peak   | 74                              | 54  | -29.68      | 64         | 1.5          |
| ---             | V           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |

| Channel 78      |             |                      |                       |                 |        | Fundamental Frequency: 2480 MHz |     |             |            |              |
|-----------------|-------------|----------------------|-----------------------|-----------------|--------|---------------------------------|-----|-------------|------------|--------------|
| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result (dBuV/m) | Remark | Limit (dBuV/m)                  |     | Margin (dB) | Table Deg. | Ant High (m) |
|                 |             |                      |                       |                 |        | Peak                            | Ave |             |            |              |
| 2483.50         | H           | 55.19                | -13.74                | 41.45           | Peak   | 74                              | 54  | -32.55      | 180        | 1.5          |
| ---             | H           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |
| 2483.50         | V           | 58.46                | -13.74                | 44.72           | Peak   | 74                              | 54  | -29.28      | 39         | 1.5          |
| ---             | V           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |



## $\pi/4$ DQPSK

| Channel 0       |             |                      |                       |                 |        | Fundamental Frequency: 2402 MHz |     |             |            |              |
|-----------------|-------------|----------------------|-----------------------|-----------------|--------|---------------------------------|-----|-------------|------------|--------------|
| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result (dBuV/m) | Remark | Limit (dBuV/m)                  |     | Margin (dB) | Table Deg. | Ant High (m) |
|                 |             |                      |                       |                 |        | Peak                            | Ave |             |            |              |
| 2390.00         | H           | 59.57                | -13.99                | 45.58           | Peak   | 74                              | 54  | -28.42      | 154        | 1.5          |
| ---             | H           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |
| 2390.00         | V           | 61.43                | -13.99                | 47.44           | Peak   | 74                              | 54  | -26.56      | 47         | 1.5          |
| ---             | V           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |

| Channel 78      |             |                      |                       |                 |        | Fundamental Frequency: 2480 MHz |     |             |            |              |
|-----------------|-------------|----------------------|-----------------------|-----------------|--------|---------------------------------|-----|-------------|------------|--------------|
| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result (dBuV/m) | Remark | Limit (dBuV/m)                  |     | Margin (dB) | Table Deg. | Ant High (m) |
|                 |             |                      |                       |                 |        | Peak                            | Ave |             |            |              |
| 2483.50         | H           | 60.34                | -13.74                | 46.6            | Peak   | 74                              | 54  | -27.4       | 101        | 1.5          |
| ---             | H           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |
| 2483.50         | V           | 59.52                | -13.74                | 45.78           | Peak   | 74                              | 54  | -28.22      | 29         | 1.5          |
| ---             | V           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |

## 8- DPSK

| Channel 0       |             |                      |                       |                 |        | Fundamental Frequency: 2402 MHz |     |             |            |              |
|-----------------|-------------|----------------------|-----------------------|-----------------|--------|---------------------------------|-----|-------------|------------|--------------|
| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result (dBuV/m) | Remark | Limit (dBuV/m)                  |     | Margin (dB) | Table Deg. | Ant High (m) |
|                 |             |                      |                       |                 |        | Peak                            | Ave |             |            |              |
| 2390.00         | H           | 59.84                | -13.99                | 45.85           | Peak   | 74                              | 54  | -28.15      | 184        | 1.5          |
| ---             | H           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |
| 2390.00         | V           | 57.29                | -13.99                | 43.3            | Peak   | 74                              | 54  | -30.7       | 51         | 1.5          |
| ---             | V           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |

| Channel 78      |             |                      |                       |                 |        | Fundamental Frequency: 2480 MHz |     |             |            |              |
|-----------------|-------------|----------------------|-----------------------|-----------------|--------|---------------------------------|-----|-------------|------------|--------------|
| Frequency (MHz) | Ant-Pol H/V | Meter Reading (dBuV) | Corrected Factor (dB) | Result (dBuV/m) | Remark | Limit (dBuV/m)                  |     | Margin (dB) | Table Deg. | Ant High (m) |
|                 |             |                      |                       |                 |        | Peak                            | Ave |             |            |              |
| 2483.50         | H           | 58.17                | -13.74                | 44.43           | Peak   | 74                              | 54  | -29.57      | 143        | 1.5          |
| ---             | H           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |
| 2483.50         | V           | 56.92                | -13.74                | 43.18           | Peak   | 74                              | 54  | -30.22      | 49         | 1.5          |
| ---             | V           | ---                  | ---                   | ---             | Ave    | 74                              | 54  | ---         | ---        | ---          |



Note:

1. Emission level = Reading level + Correction factor
2. Correction factor : Antenna factor, Cable loss, Pre-Amp, etc.
3. All emissions as described above were determining by rotating the EUT through three orthogonal axes to maximizing the emissions if the EUT belongs to hand-held or body-worn devices.
4. Measurements above 1000 MHz, Peak detector setting:  
1 MHz RBW with 1 MHz VBW (Peak Detector).
5. Measurements above 1000 MHz, Average detector setting:  
1 MHz RBW with 10Hz VBW (RMS Detector).
6. Peak detector measurement data will represent the worst case results.

Where limits are specified for both average and peak detector functions, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.



## 8. Bandwidth Measurement Data

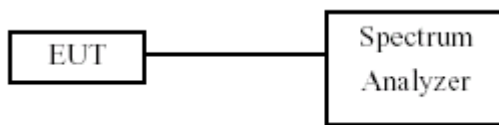
### 8.1 Test Limit

Please refer RSS-247 & section15.247.

### 8.2 Test Procedures

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW of spectrum analyzer to 100 KHz and VBW  $\geq 3 \times$  RBW.
- c. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.
- d. The 20dB Bandwidth was measured and recorded.

### 8.3 Test Setup Layout





## 8.4 Test Result and Data

Test Date: Mar. 19, 2018

Temperature: 26°C

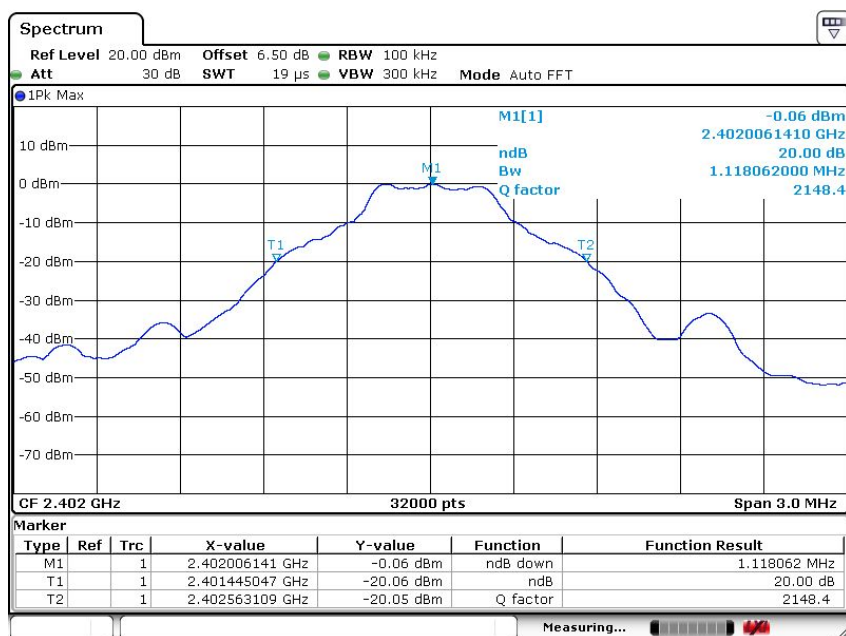
Atmospheric pressure: 1000 hPa

Humidity: 55%

| Modulation Standard | Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |
|---------------------|---------|-----------------|----------------------|
| GFSK                | 0       | 2402            | 1.1180               |
|                     | 39      | 2441            | 1.1131               |
|                     | 78      | 2480            | 1.1195               |
| $\pi/4$ DQPSK       | 0       | 2402            | 1.3680               |
|                     | 39      | 2441            | 1.3826               |
|                     | 78      | 2480            | 1.3742               |
| 8- DPSK             | 0       | 2402            | 1.3535               |
|                     | 39      | 2441            | 1.3530               |
|                     | 78      | 2480            | 1.3477               |

Modulation Standard: GFSK

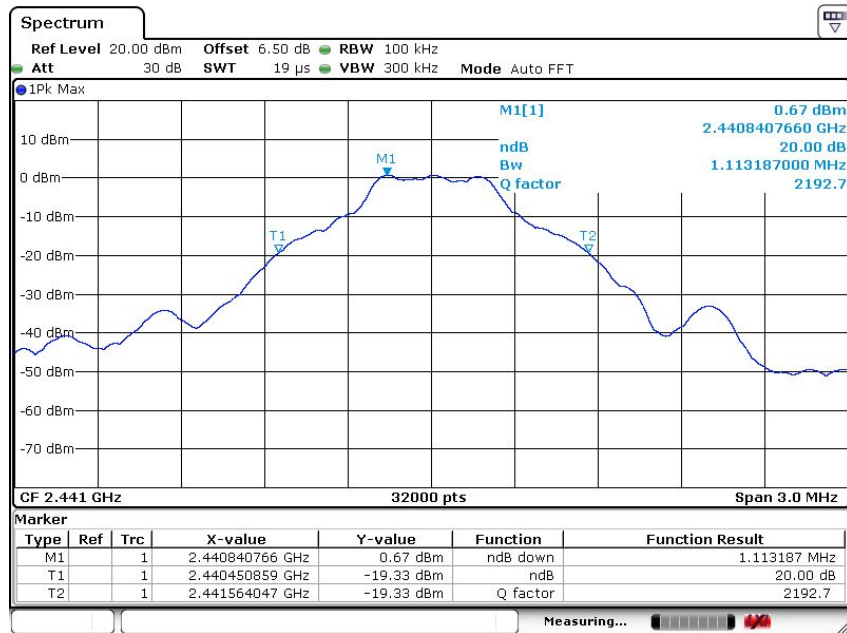
Channel: 0





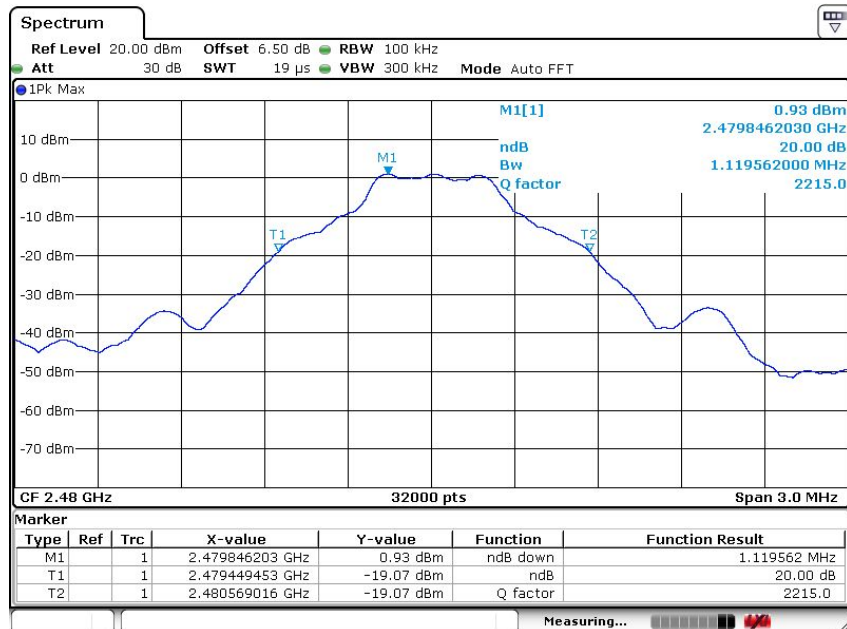
Modulation Standard: GFSK

Channel: 39



Modulation Standard: GFSK

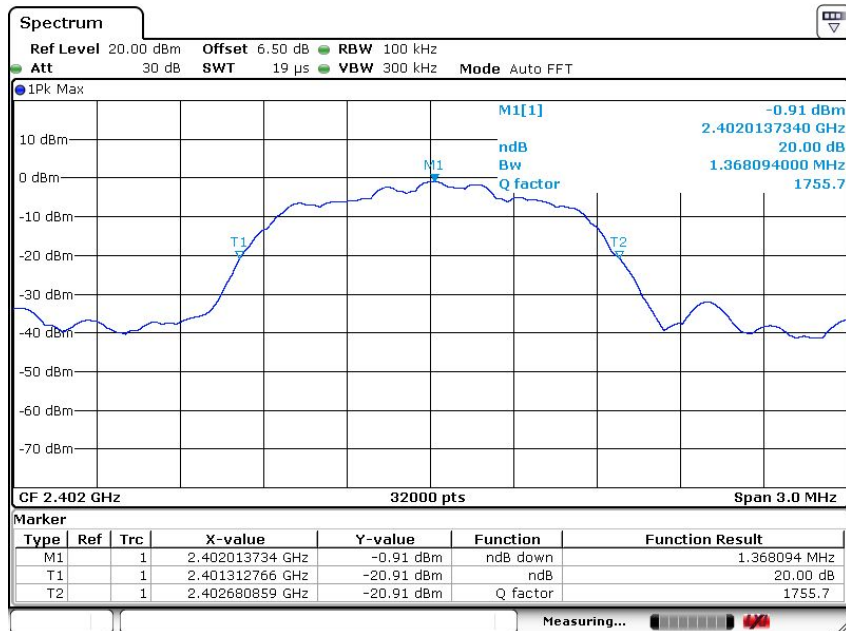
Channel: 78





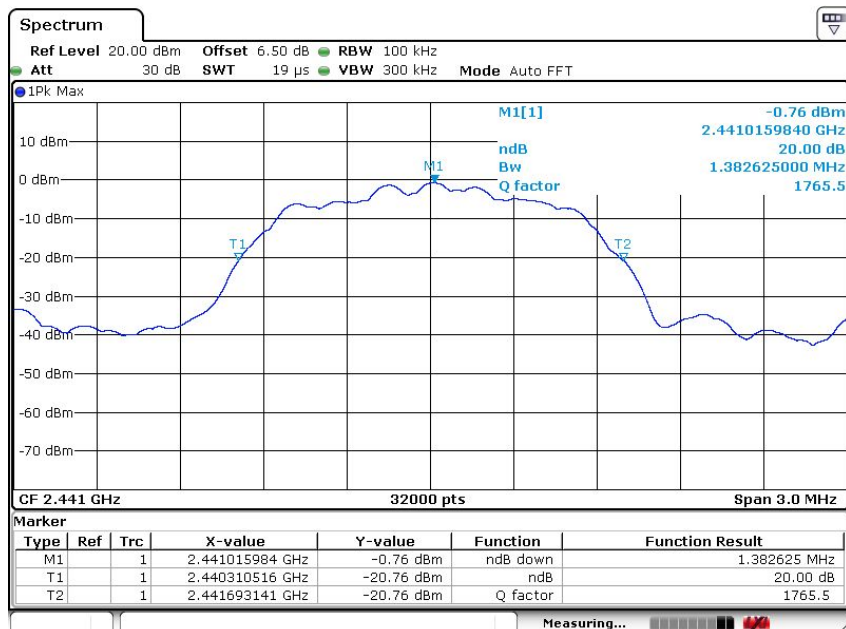
Modulation Standard:  $\pi/4$  DQPSK

Channel: 0



Modulation Standard:  $\pi/4$  DQPSK

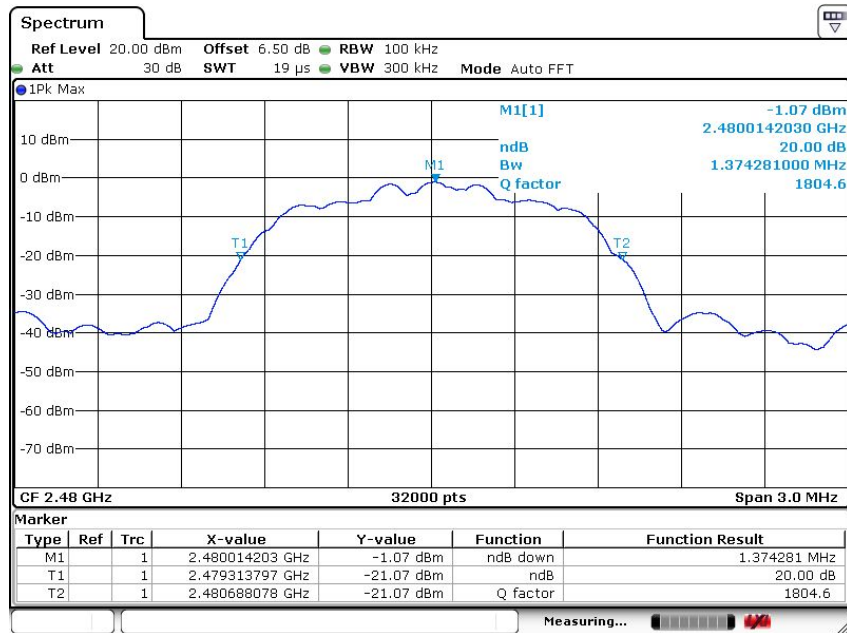
Channel: 39





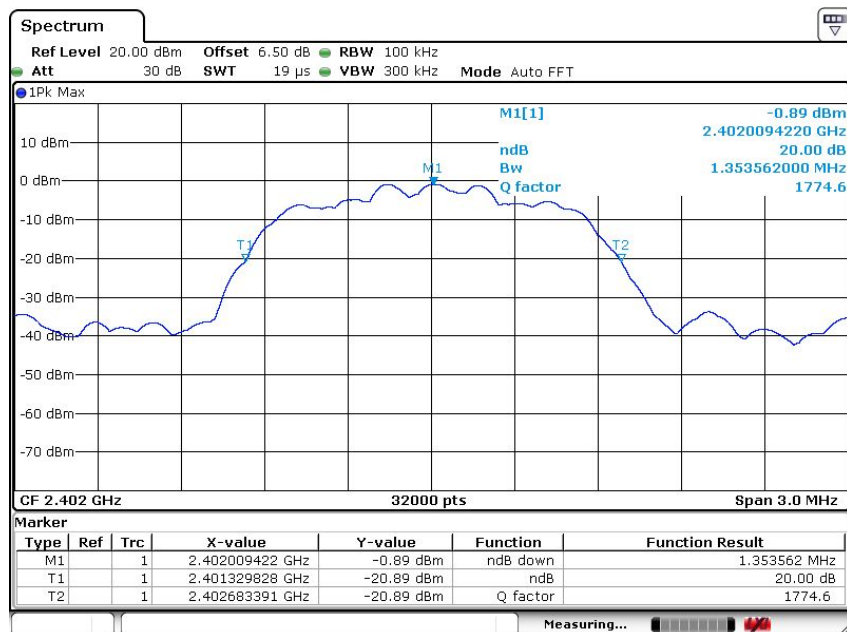
Modulation Standard:  $\pi/4$  DQPSK

Channel: 78



Modulation Standard: 8- DPSK

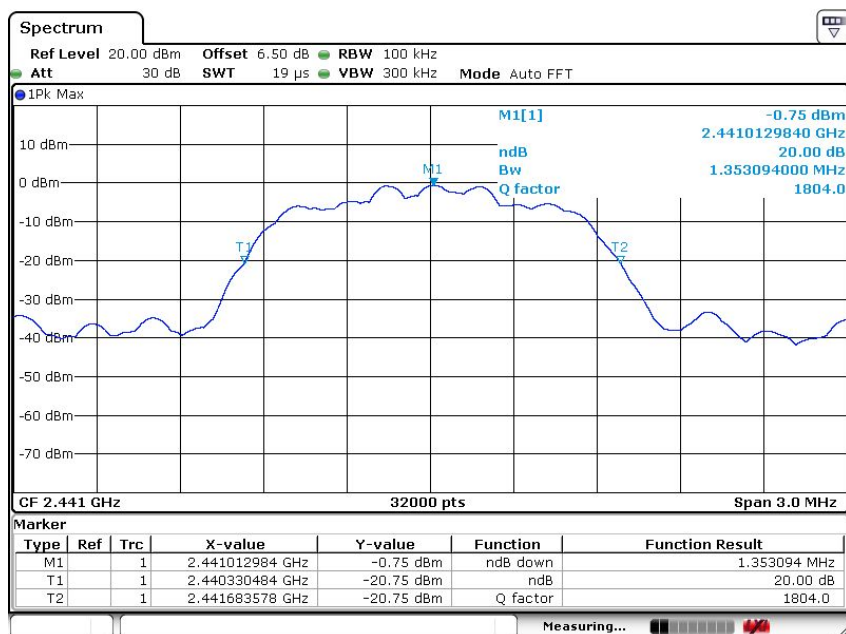
Channel: 0





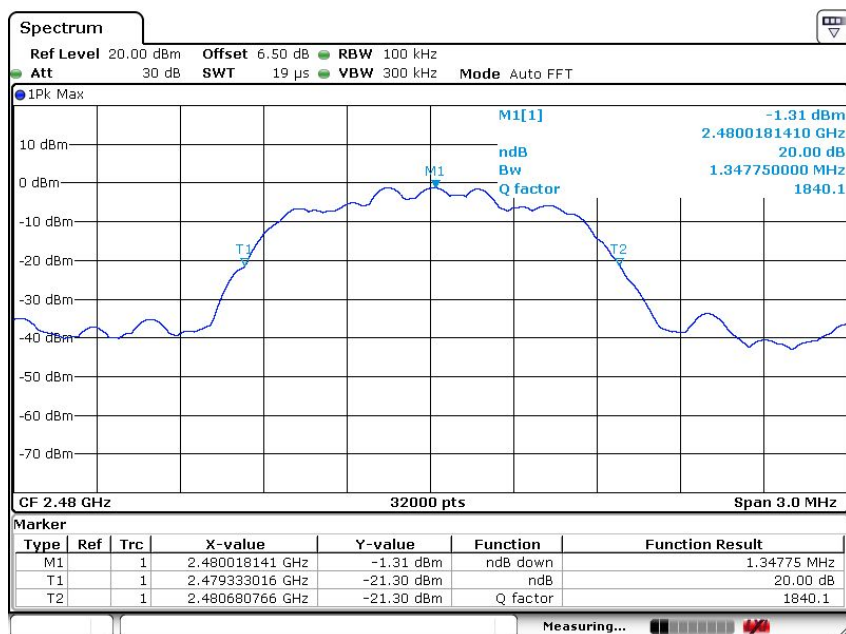
Modulation Standard: 8- DPSK

Channel: 39



Modulation Standard: 8- DPSK

Channel: 78





## **9. Maximum Peak Output Power**

### **9.1 Test Limit**

The Maximum Peak Output Power Measurement is 30dBm.

### **9.2 Test Procedures**

- a. Peak power is measured using the wideband power meter.
- b. Power is integrated over a bandwidth greater than or equal to the 99% bandwidth.
- c. The Peak Output Power was measured and recorded.

### **9.3 Test Setup Layout**

