# FCC&IC Radio Test Report

## FCC ID: YTXHA1
## IC: 9323A-HA1

**This report concerns (check one):** ■ **Original Grant** □ **Class II Change**

| | | |
|---|---|---|
| **Issued Date** | : | Jan. 14, 2014 |
| **Project No.** | : | 1312C013 |
| **Equipment** | : | HEADPHONE AMPLIFIER |
| **Model Name** | : | HA-1 |
| **Applicant** | : | OPPO Digital ,Inc |
| **Address** | : | 2629 Terminal Blvd Suite B Mountain View, CA 94043 |

**Tested by:** Neutron Engineering Inc. EMC Laboratory
**Date of Receipt:** Dec. 02, 2013
**Date of Test:** Dec. 02, 2013~ Jan. 13, 2014

**Testing Engineer** : David Mao
(David Mao)

**Technical Manager** : Leo Hung
(Leo Hung)

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## Declaration

**Neutron** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **CHINA**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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## Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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## REPORT ISSUED HISTORY

| Issued No. | Description | Issued Date |
|---|---|---|
| NEI-FICP-1-1312C013 | Original Issue. | Jan. 14, 2014 |

## 1. CERTIFICATION

| | | |
|---|---|---|
| Equipment | : | HEADPHONE AMPLIFIER |
| Brand Name | : | OPPO |
| Model Name | : | HA-1 |
| Applicant | : | OPPO Digital ,Inc |
| Manufacture | : | OPPO Digital ,Inc |
| Address | : | 2629 Terminal Blvd Suite B Mountain View, CA 94043 |
| Factory Address | : | GUANGDONG OPPO MOBILE TELECOMMUNICATIONS CORP LTD<br>No.18 Haibin Road,Wusha,Chang-an,Dongguan ,Guangdong,China,523860 |
| Date of Test | : | Dec. 02, 2013~ Jan. 13, 2014 |
| Test Item | : | ENGINEERING SAMPLE |
| Standard(s) | : | FCC Part15, Subpart C : 2012 (15.247) / ANSI C63.4 : 2009 /<br>FCC Public Notice DA 00-705, March 30, 2000.<br>Canada RSS-210: 2010<br>RSS-GEN Issue 3, Dec 2010 |

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FICP-1-1312C013) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

## 2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

| Applied Standard(s): 47 CFR Part 15, Subpart C: 2012; Canada RSS-210:2010; RSS-GEN Issue 3, Dec 2010 | | | | |
|---|---|---|---|---|
| Standard(s) Section | | Test Item | Judgment | Remark |
| FCC | IC | | | |
| 15.207 | RSS-GEN Issue 3, Dec 2010 7.2.4 | Conducted Emission | PASS | |
| 15.247(d) | RSS-210, Issue 8, Annex 8, A8.5 | Antenna conducted Spurious Emission | PASS | |
| 15.247 (a)(1) | RSS-210, Issue 8, Annex 8, A8.1(b) | Hopping Channel Separation | PASS | |
| 15.247 (b)(1) | RSS-210, Issue 8, Annex 8, A8.1(b) | Peak Output Power | PASS | |
| 15.247(d) 15.209 | RSS-210, Issue 8, Annex 8, Section 8.5 | Radiated Spurious Emission | PASS | |
| 15.247 (a)(1)(iii) | RSS-210, Issue 8, Annex 8, A8.1(d) | Number of Hopping Frequency | PASS | |
| 15.247 (a)(1)(iii) | RSS-210, Issue 8, Annex 8, A8.1(d) | Dwell Time | PASS | |
| 15.205 | RSS-GEN Issue 3, Dec 2010 7.2.2 | Restricted Bands | PASS | |
| 15.203 | - | Antenna Requirement | PASS | |

Note:

(1)" N/A" denotes test is not applicable in this test report

(2) According to FCC Public Notice DA 00-705, March 30, 2000.

## 2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-C02/DG-CB03** at the location of No.3,Jinshagang 1st Road, Shixia, Dalang Town, Dong Guan, China.523792
Neutron's test firm number for FCC: 319330
Neutron's test firm number for IC: 4428B-1

## 2.2 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:

The reported uncertainty of measurement **y** ± **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** %.

A. Conducted Measurement :

| Test Site | Method | Measurement Frequency Range | U，(dB) | Note |
|---|---|---|---|---|
| DG-C02 | CISPR | 150 KHz ~ 30MHz | 1.94 | |

B. Radiated Measurement :

| Test Site | Method | Measurement Frequency Range | Ant. H / V | U，(dB) | Note |
|---|---|---|---|---|---|
| DG-CB03 | CISPR | 9KHz~30MHz | V | 3.79 | |
| | | 9KHz~30MHz | H | 3.57 | |
| | | 30MHz ~ 200MHz | V | 3.82 | |
| | | 30MHz ~ 200MHz | H | 3.60 | |
| | | 200MHz ~ 1,000MHz | V | 3.86 | |
| | | 200MHz ~ 1,000MHz | H | 3.94 | |
| | | 1GHz~18GHz | V | 3.12 | |
| | | 1GHz~18GHz | H | 3.68 | |
| | | 18GHz~40GHz | V | 4.15 | |
| | | 18GHz~40GHz | H | 4.14 | |

# 3. GENERAL INFORMATION

## 3.1 GENERAL DESCRIPTION OF EUT

| | | |
|---|---|---|
| Equipment | HEADPHONE AMPLIFIER | |
| Brand Name | OPPO | |
| Model Name for FCC | HA-1 | |
| Model Difference | N/A | |
| Output Power (Max.) | Operation Frequency | 2402~2480 MHz |
| | Modulation Technology | GFSK(1Mbps)<br>$\pi$/4-DQPSK(2Mbps)<br>8-DPSK(3Mbps) |
| | Bit Rate of Transmitter | |
| | Output Power Max. | -0.91dBm (1Mbps)<br>-5.26dBm (3Mbps) |
| Power Source | AC Mains | |
| Power Rating | I/P:110-120V/220-240 50/60Hz O/P:70W | |

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) |
| 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 Table for Filed Antenna

.

| Ant. | Manufacturer | Model Name | Antenna Type | Connector | Gain (dBi) | Note |
|---|---|---|---|---|---|---|
| 1 | N/A | AN2400-33B02BRASM | Dipole | N/A | 2.7 | TX/RX |

## 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Pretest Mode | Description |
|---|---|
| Mode 1 | TX Mode **Note (1)** |
| Mode 2 | Bluetooth |

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

| **For Conducted Emission** | |
|---|---|
| Final Test Mode | Description |
| Mode 2 | Bluetooth |

| **For Radiated Emission** | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | TX Mode **Note (1)** |

**Note:**

(1) The measurements are performed at the high, middle, low available channels.

(2) The measurements for Hopping Channel Separation, Bandwidth and Peak Output Power were tested during 1Mbps, 2Mbps and 3Mbps, the worst case are 1Mbps and 3Mbps, only worst case was documented.

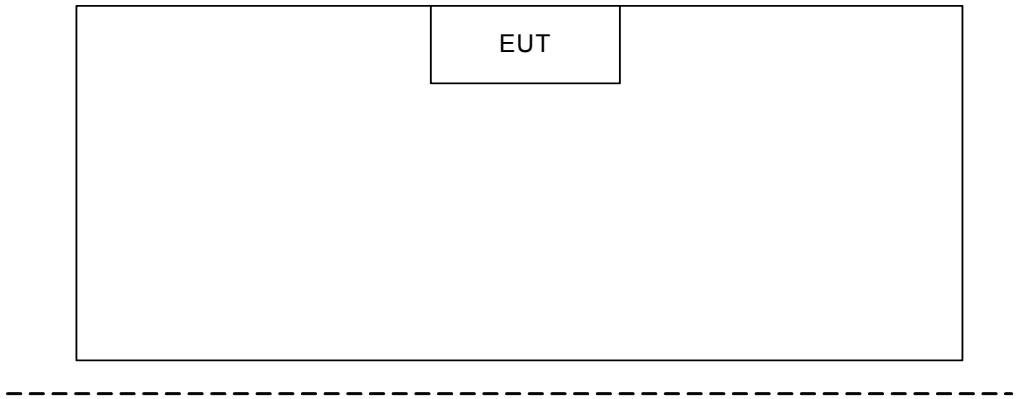
## 3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

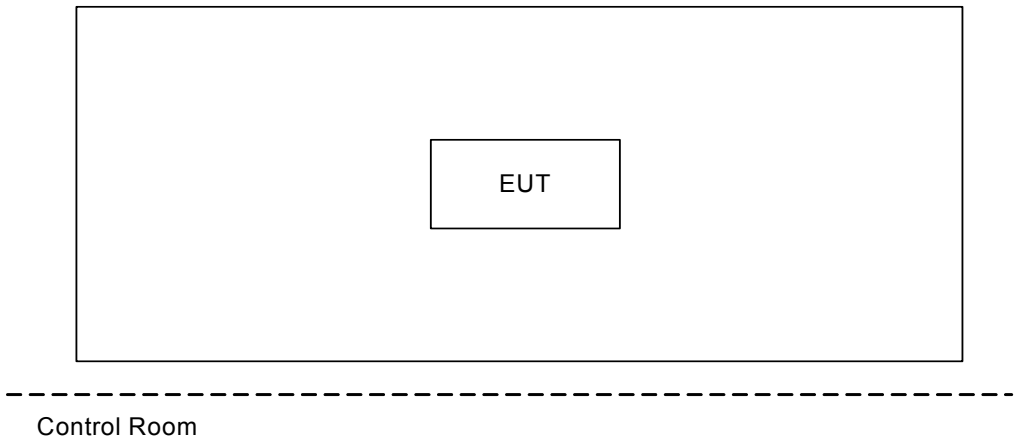
| Test software version | Bluetest | | |
|---|---|---|---|
| Frequency | 2402 MHz | 2441 MHz | 2480 MHz |
| Parameters-1Mbps | 63 | 63 | 63 |
| Parameters-3Mbps | 100 | 100 | 100 |

## 3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

**Conducted TX Mode:**




**Radiated TX Mode:**



### 3.5 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.

| Item | Equipment | Mfr/Brand | Model/Type No. | FCC ID/IC | Series No. | Note |
|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - |

| Item | Shielded Type | Ferrite Core | Length | Note |
|---|---|---|---|---|
| - | - | - | - | - |

# 4. EMC EMISSION TEST

## 4.1 CONDUCTED EMISSION MEASUREMENT

### 4.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

| Frequency (MHz) | Class A (dBuV) | | Class B (dBuV) | | Standard |
|---|---|---|---|---|---|
| | Quasi-peak | Average | Quasi-peak | Average | |
| 0.15 -0.5 | 79.00 | 66.00 | 66 - 56 * | 56 - 46 * | CISPR |
| 0.50 -5.0 | 73.00 | 60.00 | 56.00 | 46.00 | CISPR |
| 5.0 -30.0 | 73.00 | 60.00 | 60.00 | 50.00 | CISPR |
| | | | | | |
| 0.15 -0.5 | 79.00 | 66.00 | 66 - 56 * | 56 - 46 * | FCC |
| 0.50 -5.0 | 73.00 | 60.00 | 56.00 | 46.00 | FCC |
| 5.0 -30.0 | 73.00 | 60.00 | 60.00 | 50.00 | FCC |

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 |

### 4.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal 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.

b. 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.

c. 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.

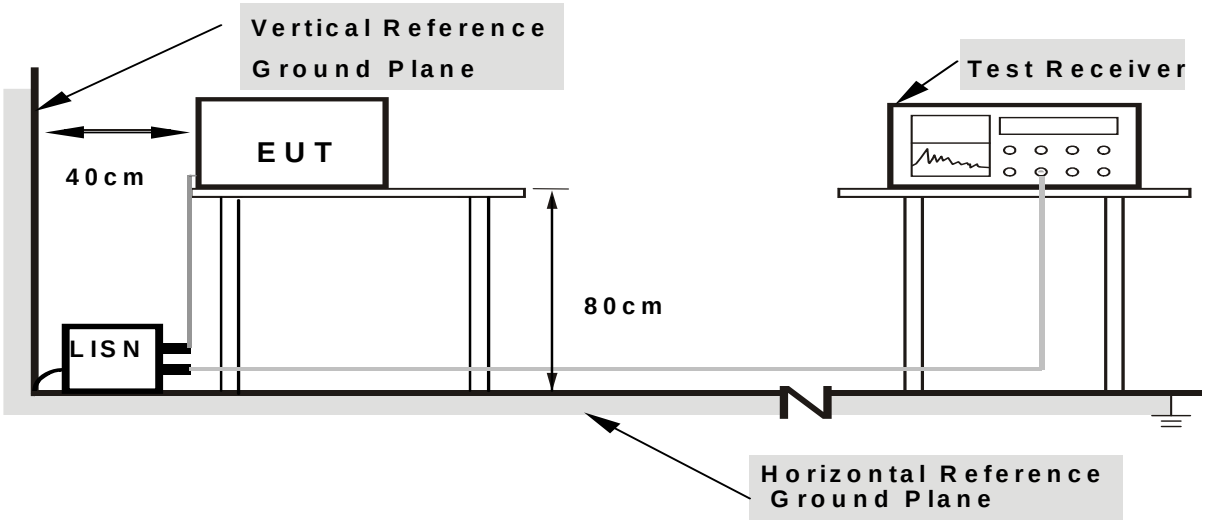
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 4.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 4.1.4 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

### 4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuously transmitting/receiving data or hopping on mode.

### 4.1.6 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: 120V/60Hz

### 4.1.7 TEST RESULTS

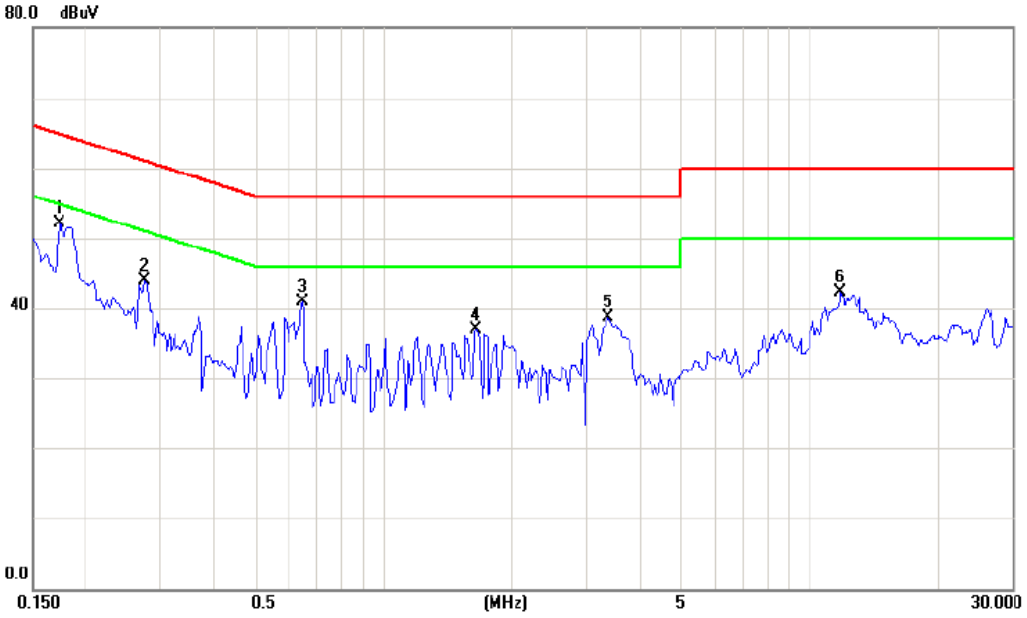
Remark:

(1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform in this case, a "*" marked in AVG Mode column of Interference Voltage Measured.

(2) Measuring frequency range from 150KHz to 30MHz.

| Test Mode: | Bluetooth |
|---|---|

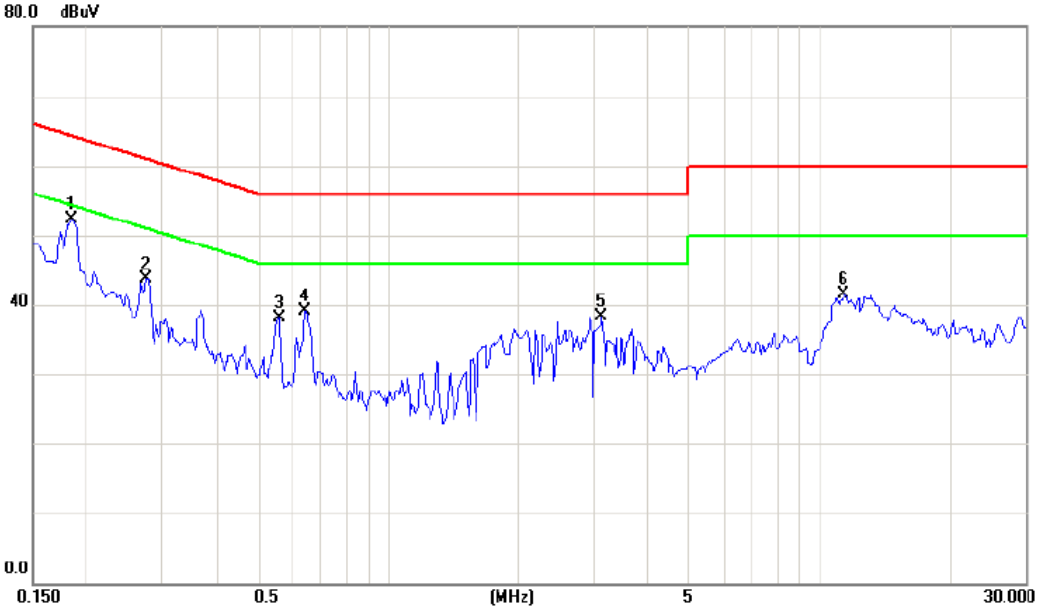
**Line**




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | * | 0.1734 | 42.48 | 9.63 | 52.11 | 64.80 | -12.69 | peak | |
| 2 | | 0.2750 | 34.15 | 9.67 | 43.82 | 60.97 | -17.15 | peak | |
| 3 | | 0.6461 | 31.28 | 9.72 | 41.00 | 56.00 | -15.00 | peak | |
| 4 | | 1.6617 | 27.17 | 9.80 | 36.97 | 56.00 | -19.03 | peak | |
| 5 | | 3.3750 | 28.80 | 9.88 | 38.68 | 56.00 | -17.32 | peak | |
| 6 | | 11.9102 | 32.18 | 10.17 | 42.35 | 60.00 | -17.65 | peak | |

| Test Mode: | Bluetooth |
|---|---|

**Neutral**




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | * | 0.1852 | 42.54 | 9.71 | 52.25 | 64.25 | -12.00 | peak | |
| 2 | | 0.2750 | 34.05 | 9.72 | 43.77 | 60.97 | -17.20 | peak | |
| 3 | | 0.5563 | 28.40 | 9.74 | 38.14 | 56.00 | -17.86 | peak | |
| 4 | | 0.6422 | 29.37 | 9.75 | 39.12 | 56.00 | -16.88 | peak | |
| 5 | | 3.1290 | 28.42 | 9.90 | 38.32 | 56.00 | -17.68 | peak | |
| 6 | | 11.4297 | 31.29 | 10.28 | 41.57 | 60.00 | -18.43 | peak | |

## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 RADIATED EMISSION LIMITS (Frequency Range 9KHz -1000MHz)

20dB in any 100 KHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) & RSS-210 section 2.2& Annex 8 (A8.5), then the 15.209(a) & RSS-Gen limit in the table below has to be followed.

| Frequency (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 |
| 960~1000 | 500 | 3 |

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| Frequency (MHz) | dB(uV/m) (at 3 meters) | |
|---|---|---|
| | 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).

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RBW / VBW (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

| Spectrum Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9KHz ~90KHz for PK/AVG detector |
| Start ~ Stop Frequency | 90KHz ~110KHz for QP detector |
| Start ~ Stop Frequency | 110KHz ~490KHz for PK/AVG detector |
| Start ~ Stop Frequency | 490KHz ~30MHz for QP detector |
| Start ~ Stop Frequency | 30MHz~1000MHz for QP detector |

### 4.2.2 TEST PROCEDURE

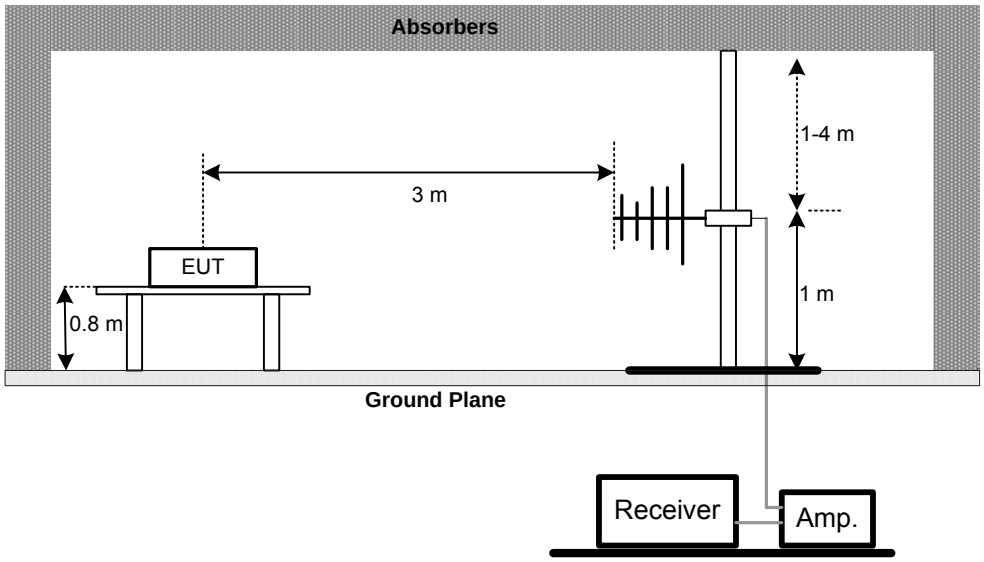
a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. 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.
e. 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.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 4.2.3 DEVIATION FROM TEST STANDARD

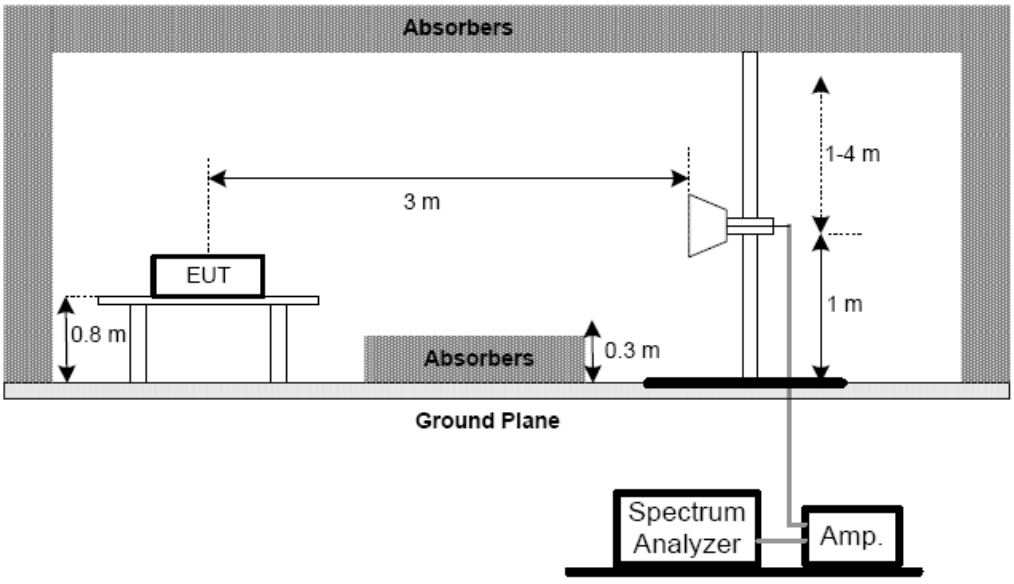
No deviation

### 4.2.4 TEST SETUP

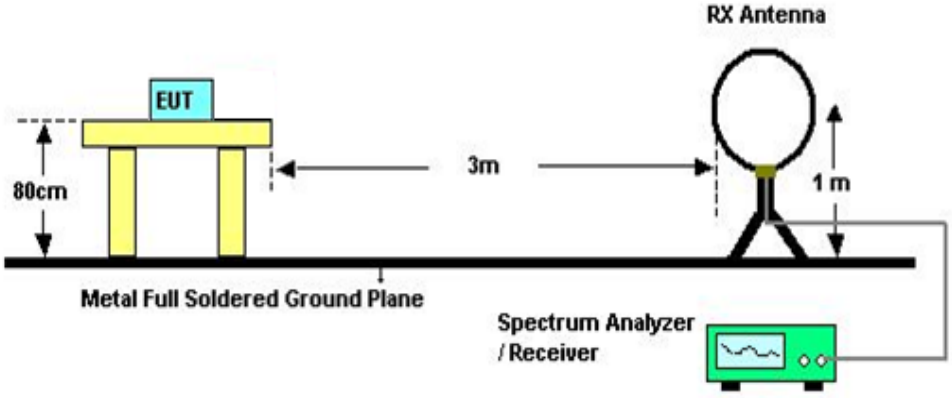
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz




(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



(C) For radiated emissions below 30MHz




### 4.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.5** Unless otherwise a special operating condition is specified in the follows during the testing

### 4.2.6 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: 120V/60Hz

### 4.2.7 TEST RESULTS (BELOW 30MHZ)

| Test Mode: | TX 2402MHz |
|---|---|

| Freq. (MHz) | Ant. 0°/90° | Reading(RA) (dBuV) | Corr.Factor(CF) (dB) | Measured(FS) (dBuV/m) | Limits(QP) (dBuV/m) | Margin (dB) | Note |
|---|---|---|---|---|---|---|---|
| 0.0094 | 0° | 16.48 | 23.10 | 39.58 | 128.19 | -88.61 | AV |
| 0.0094 | 0° | 19.21 | 23.10 | 42.31 | 148.19 | -105.88 | PK |
| 0.0137 | 0° | 18.89 | 23.10 | 41.99 | 124.87 | -82.88 | AV |
| 0.0137 | 0° | 20.54 | 23.10 | 43.64 | 144.87 | -101.23 | PK |
| 0.0245 | 0° | 16.19 | 24.02 | 40.21 | 119.82 | -79.62 | AV |
| 0.0245 | 0° | 19.75 | 24.02 | 43.77 | 139.82 | -96.06 | PK |
| 0.0328 | 0° | 18.16 | 23.49 | 41.65 | 117.29 | -75.64 | AV |
| 0.0328 | 0° | 20.41 | 23.49 | 43.90 | 137.29 | -93.39 | PK |
| 0.4260 | 0° | 18.64 | 19.98 | 38.62 | 95.02 | -56.40 | AVG |
| 0.4260 | 0° | 21.91 | 19.98 | 41.89 | 115.02 | -73.13 | PK |
| 1.5250 | 0° | 18.82 | 19.55 | 38.37 | 63.94 | -25.57 | QP |

| Freq. (MHz) | Ant. 0°/90° | Reading(RA) (dBuV) | Corr.Factor(CF) (dB) | Measured(FS) (dBuV/m) | Limits(QP) (dBuV/m) | Margin (dB) | Note |
|---|---|---|---|---|---|---|---|
| 0.0093 | 90° | 18.03 | 24.30 | 42.33 | 128.28 | -85.95 | AVG |
| 0.0093 | 90° | 20.46 | 24.30 | 44.76 | 148.28 | -103.52 | PK |
| 0.0237 | 90° | 17.55 | 24.07 | 41.62 | 120.11 | -78.49 | AVG |
| 0.0237 | 90° | 20.33 | 24.07 | 44.40 | 140.11 | -95.71 | PK |
| 0.0318 | 90° | 18.43 | 23.55 | 41.98 | 117.56 | -75.57 | AVG |
| 0.0318 | 90° | 20.67 | 23.55 | 44.22 | 137.56 | -93.33 | PK |
| 0.0429 | 90° | 17.85 | 22.85 | 40.70 | 114.96 | -74.26 | AVG |
| 0.0429 | 90° | 20.39 | 22.85 | 43.24 | 134.96 | -91.72 | PK |
| 0.2390 | 90° | 17.45 | 20.42 | 37.87 | 100.04 | -62.16 | AVG |
| 0.2390 | 90° | 20.72 | 20.42 | 41.14 | 120.04 | -78.89 | PK |
| 1.6750 | 90° | 18.63 | 19.53 | 38.16 | 63.12 | -24.96 | QP |

Remark:

(1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
(2) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
(3) Limit line = specific limits (dBuV) + distance extrapolation factor.

### 4.2.8 TEST RESULTS: 30MHZ - 1000MHZ

Remark:

(1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz；SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz.

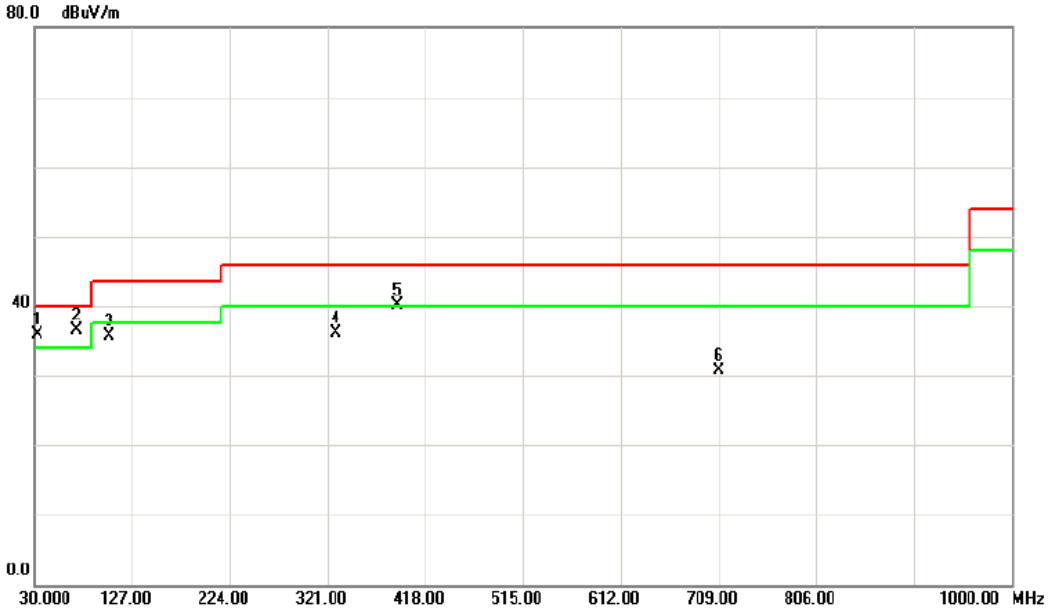
(2) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.

(3) Measuring frequency range from 30MHz to 1000MHz.

(4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

| Test Mode: | TX 2402MHz _CH00_1Mbps |
|---|---|

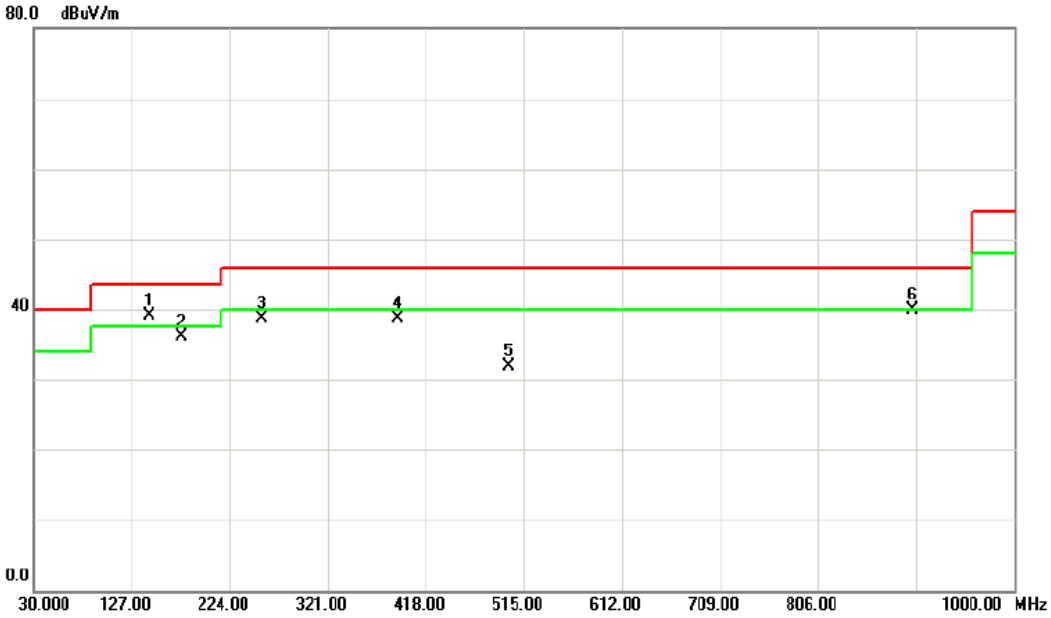
## Vertical




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | ! | 32.9100 | 51.70 | -15.75 | 35.95 | 40.00 | -4.05 | peak | |
| 2 | * | 71.7100 | 52.90 | -16.46 | 36.44 | 40.00 | -3.56 | peak | |
| 3 | | 104.6900 | 51.24 | -15.52 | 35.72 | 43.50 | -7.78 | peak | |
| 4 | | 329.7300 | 47.41 | -11.38 | 36.03 | 46.00 | -9.97 | peak | |
| 5 | ! | 389.8700 | 50.40 | -10.20 | 40.20 | 46.00 | -5.80 | peak | |
| 6 | | 709.0000 | 35.61 | -4.83 | 30.78 | 46.00 | -15.22 | peak | |

| Test Mode: | TX 2402MHz _CH00_1Mbps |
|---|---|

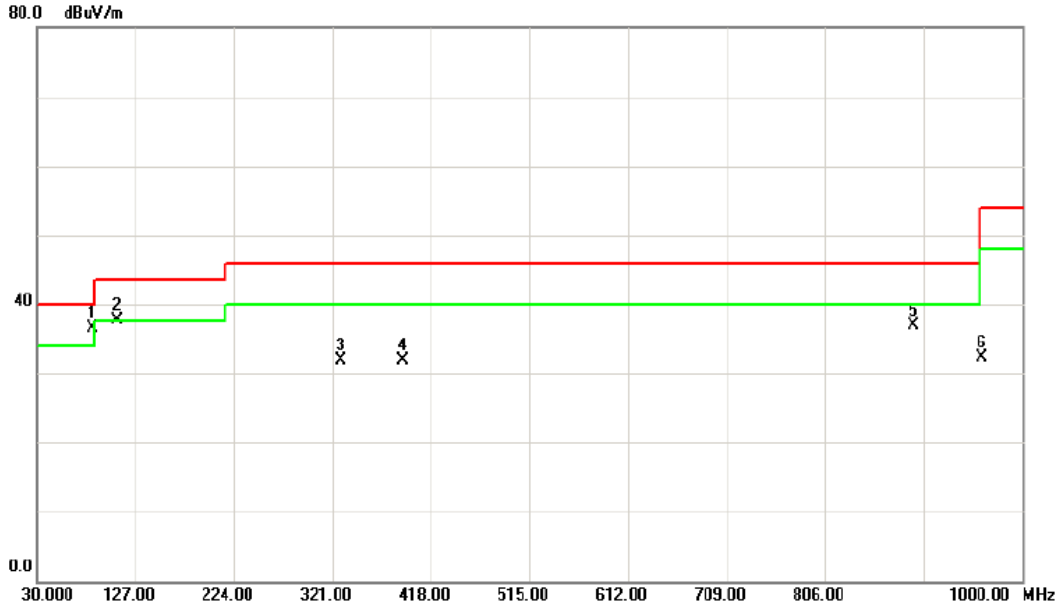
## Horizontal




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 144.4600 | 52.86 | -13.76 | 39.10 | 43.50 | -4.40 | peak | |
| 2 | | 176.4700 | 48.81 | -12.80 | 36.01 | 43.50 | -7.49 | peak | |
| 3 | | 256.0100 | 53.50 | -14.84 | 38.66 | 46.00 | -7.34 | peak | |
| 4 | | 389.8700 | 48.95 | -10.20 | 38.75 | 46.00 | -7.25 | peak | |
| 5 | | 500.4500 | 42.26 | -10.31 | 31.95 | 46.00 | -14.05 | peak | |
| 6 | | 900.0900 | 41.10 | -1.27 | 39.83 | 46.00 | -6.17 | peak | |

| Test Mode: | TX 2441MHz _CH39_1Mbps |
|---|---|

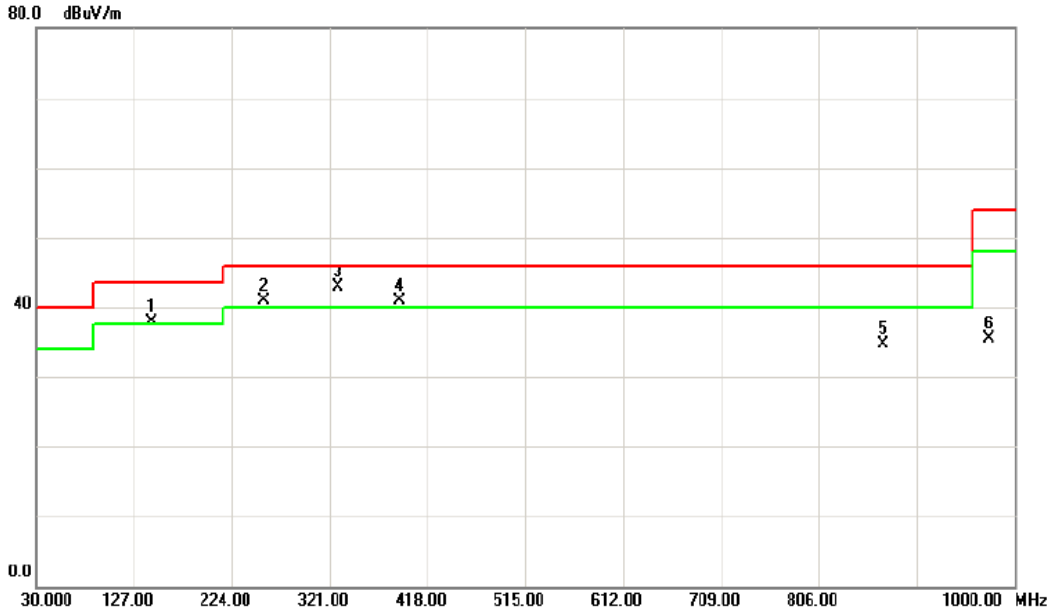
## Vertical




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 84.3200 | 54.40 | -17.82 | 36.58 | 40.00 | -3.42 | peak | |
| 2 | ! | 109.5400 | 52.58 | -14.80 | 37.78 | 43.50 | -5.72 | peak | |
| 3 | | 329.7300 | 43.21 | -11.38 | 31.83 | 46.00 | -14.17 | peak | |
| 4 | | 389.8700 | 42.18 | -10.20 | 31.98 | 46.00 | -14.02 | peak | |
| 5 | | 893.3000 | 38.56 | -1.59 | 36.97 | 46.00 | -9.03 | peak | |
| 6 | | 960.2300 | 32.58 | -0.37 | 32.21 | 54.00 | -21.79 | peak | |

| Test Mode: | TX 2441MHz _CH39_1Mbps |
|---|---|

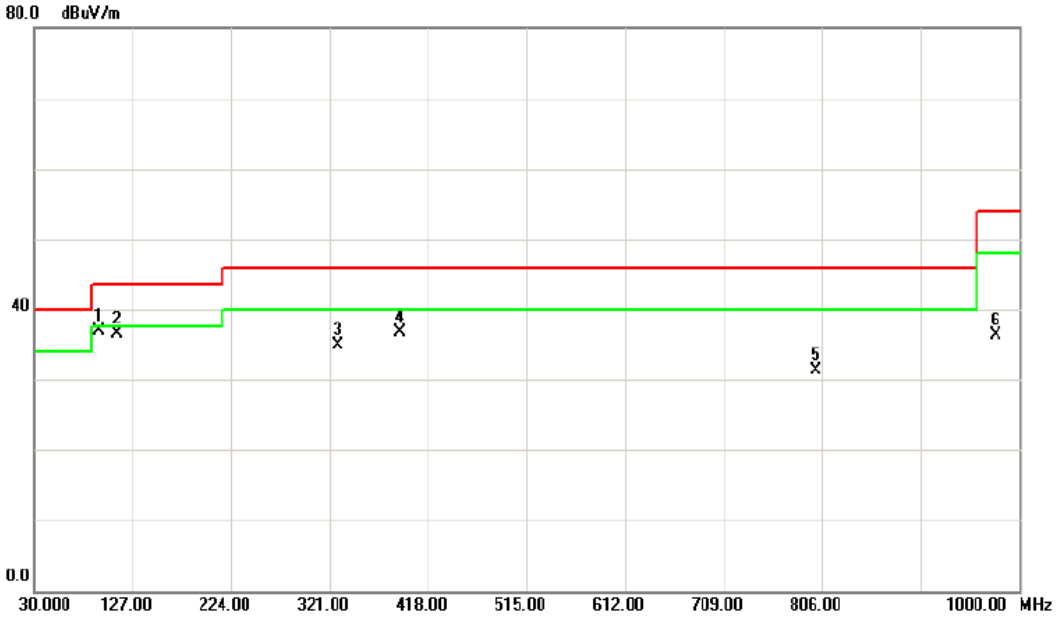
## Horizontal




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | ! | 144.4600 | 51.63 | -13.76 | 37.87 | 43.50 | -5.63 | peak | |
| 2 | ! | 256.0100 | 55.76 | -14.84 | 40.92 | 46.00 | -5.08 | peak | |
| 3 | * | 329.7300 | 54.22 | -11.38 | 42.84 | 46.00 | -3.16 | peak | |
| 4 | ! | 389.8700 | 51.19 | -10.20 | 40.99 | 46.00 | -5.01 | peak | |
| 5 | | 870.0200 | 37.47 | -2.71 | 34.76 | 46.00 | -11.24 | peak | |
| 6 | | 974.7800 | 35.71 | -0.13 | 35.58 | 54.00 | -18.42 | peak | |

| Test Mode: | TX 2480MHz _CH78_1Mbps |
|---|---|

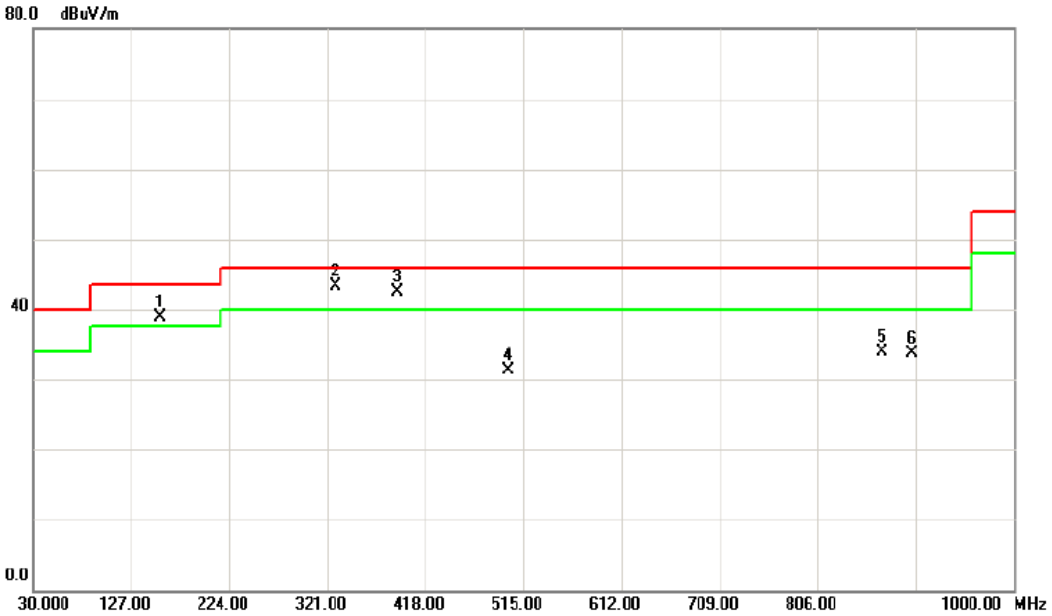
## Vertical




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 94.0200 | 54.40 | -17.43 | 36.97 | 43.50 | -6.53 | peak | |
| 2 | | 112.4500 | 51.10 | -14.52 | 36.58 | 43.50 | -6.92 | peak | |
| 3 | | 329.7300 | 46.23 | -11.38 | 34.85 | 46.00 | -11.15 | peak | |
| 4 | | 389.8700 | 46.81 | -10.20 | 36.61 | 46.00 | -9.39 | peak | |
| 5 | | 800.1800 | 34.35 | -3.11 | 31.24 | 46.00 | -14.76 | peak | |
| 6 | | 976.7200 | 36.46 | -0.10 | 36.36 | 54.00 | -17.64 | peak | |

| Test Mode: | TX 2480MHz _CH78_1Mbps |
|---|---|

## Horizontal




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | ! | 156.1000 | 52.50 | -13.69 | 38.81 | 43.50 | -4.69 | peak | |
| 2 | * | 329.7300 | 54.61 | -11.38 | 43.23 | 46.00 | -2.77 | peak | |
| 3 | ! | 389.8700 | 52.75 | -10.20 | 42.55 | 46.00 | -3.45 | peak | |
| 4 | | 500.4500 | 41.53 | -10.31 | 31.22 | 46.00 | -14.78 | peak | |
| 5 | | 870.0200 | 36.66 | -2.71 | 33.95 | 46.00 | -12.05 | peak | |
| 6 | | 900.0900 | 34.99 | -1.27 | 33.72 | 46.00 | -12.28 | peak | |

### 4.2.9 TEST RESULTS (ABOVE 1000 MHZ)

Remark:

(1) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.

(2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency. "F" denotes fundamental frequency;"H" denotes spurious frequency. "E" denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)

(3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission

(4) Data of measurement within this frequency range shown "*" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

(6) EUT Orthogonal Axis:
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand

(7) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

| Test Mode: | TX 2402MHz _CH00_1Mbps |
|---|---|

| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| 2390.00 | V | 24.04 | 13.32 | 34.09 | 58.13 | 47.41 | 74.00 | 54.00 | X/E |
| **2402.20** | **V** | **69.17** | **58.56** | **34.12** | **103.29** | **92.68** | | | **X/F** |
| 4803.98 | V | 43.14 | 29.53 | 6.38 | 49.52 | 35.91 | 74.00 | 54.00 | X/H |

| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| 2390.00 | H | 24.33 | 13.31 | 34.09 | 58.42 | 47.40 | 74.00 | 54.00 | X/E |
| **2402.15** | **H** | **69.64** | **59.01** | **34.12** | **103.76** | **93.13** | | | **X/F** |
| 4803.53 | H | 40.41 | 28.20 | 6.38 | 46.79 | 34.58 | 74.00 | 54.00 | X/H |

| Test Mode: | TX 2441MHz _CH39_1Mbps |
|---|---|

| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| **2440.80** | **V** | **70.21** | **60.14** | **34.25** | **104.46** | **94.39** | | | **X/F** |
| 4881.93 | V | 42.35 | 29.80 | 6.61 | 48.96 | 36.41 | 74.00 | 54.00 | X/H |

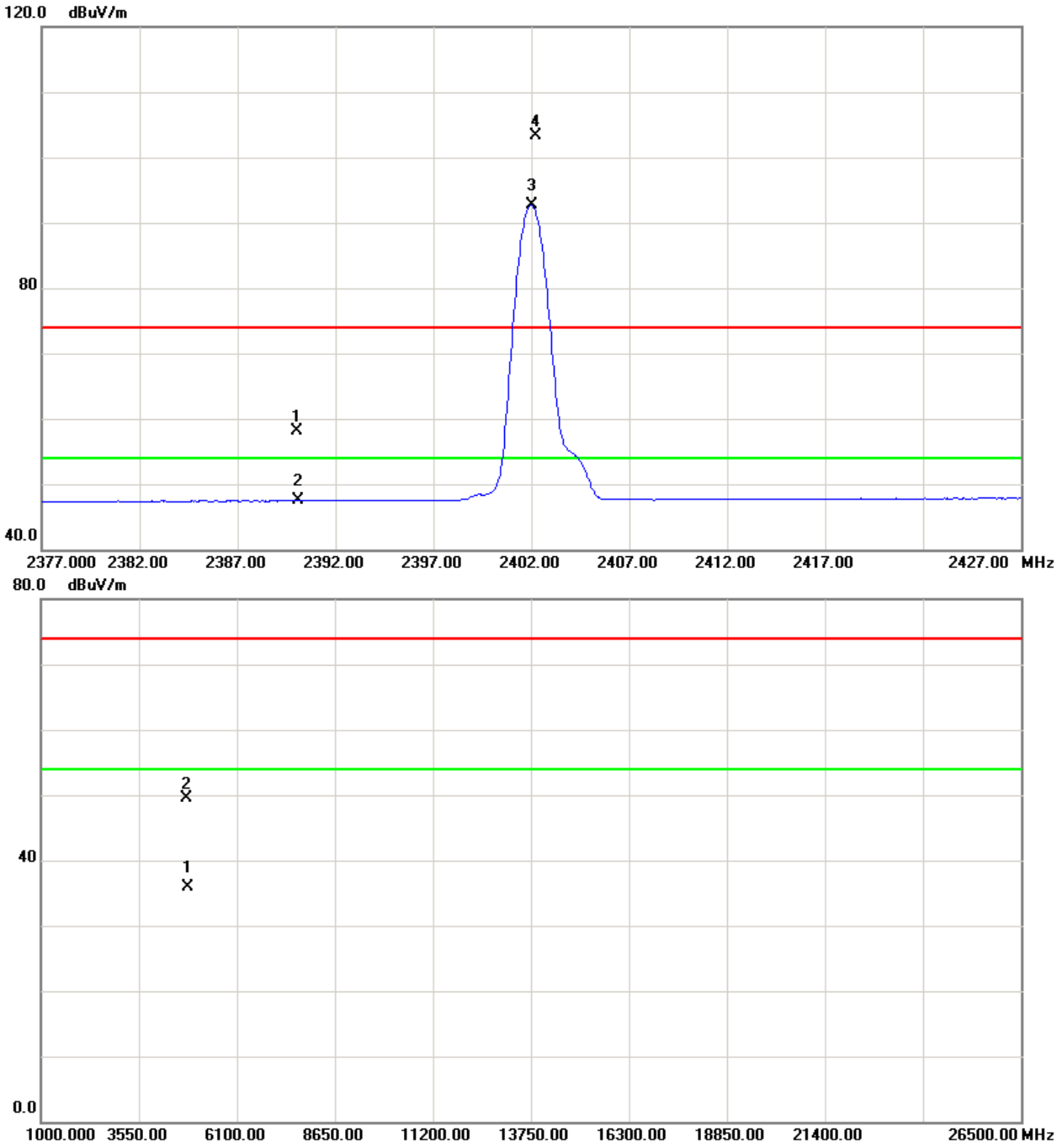
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| **2440.85** | **H** | **70.36** | **60.22** | **34.25** | **104.61** | **94.47** | | | **X/F** |
| 4882.05 | H | 42.01 | 28.97 | 6.61 | 48.62 | 35.58 | 74.00 | 54.00 | X/H |

| Test Mode: | TX 2480MHz _CH78_1Mbps |
|---|---|

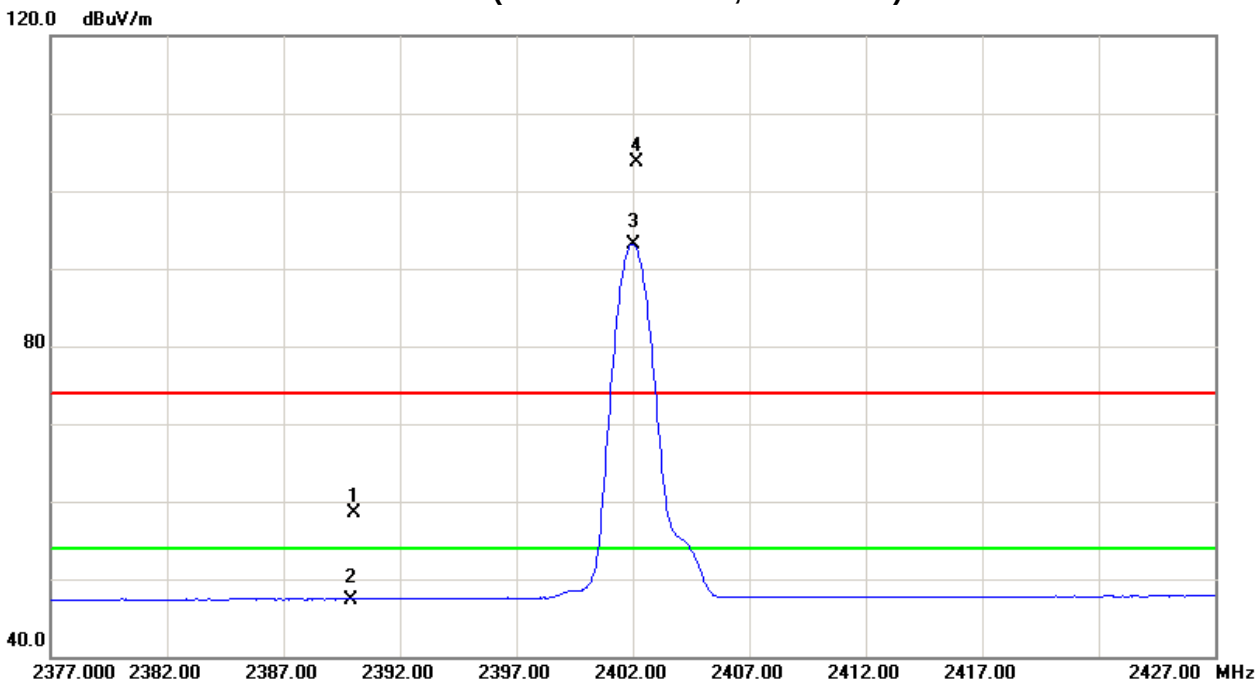
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| **2479.80** | **V** | **69.91** | **59.73** | **34.36** | **104.27** | **94.09** | | | **X/F** |
| 2483.50 | V | 24.05 | 13.67 | 34.37 | 58.42 | 48.04 | 74.00 | 54.00 | X/E |
| 4960.04 | V | 43.47 | 29.38 | 6.83 | 50.30 | 36.21 | 74.00 | 54.00 | X/H |

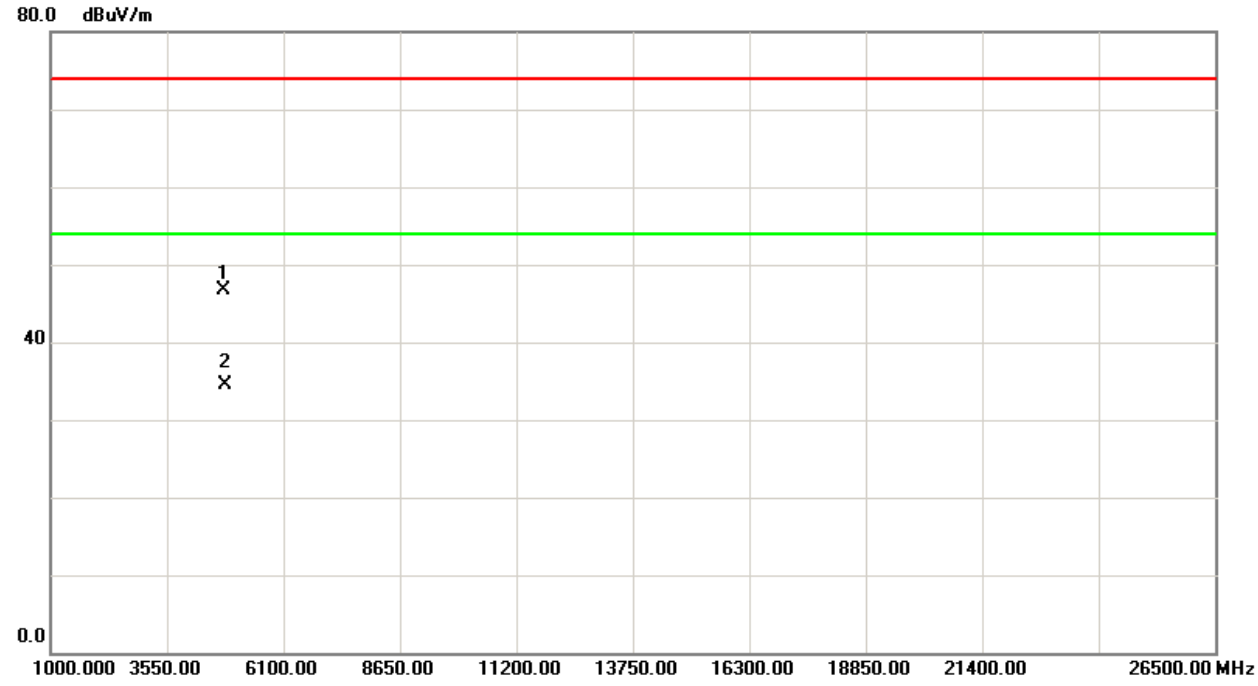
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| **2480.00** | **H** | **59.08** | **69.89** | **34.36** | **93.44** | **104.25** | | | **X/F** |
| 2483.50 | H | 24.13 | 13.61 | 34.37 | 58.50 | 47.98 | 74.00 | 54.00 | X/E |
| 4960.17 | H | 40.54 | 28.06 | 6.83 | 47.37 | 34.89 | 74.00 | 54.00 | X/H |

**TX CH00(Above 1000 MHz, Vertical)**

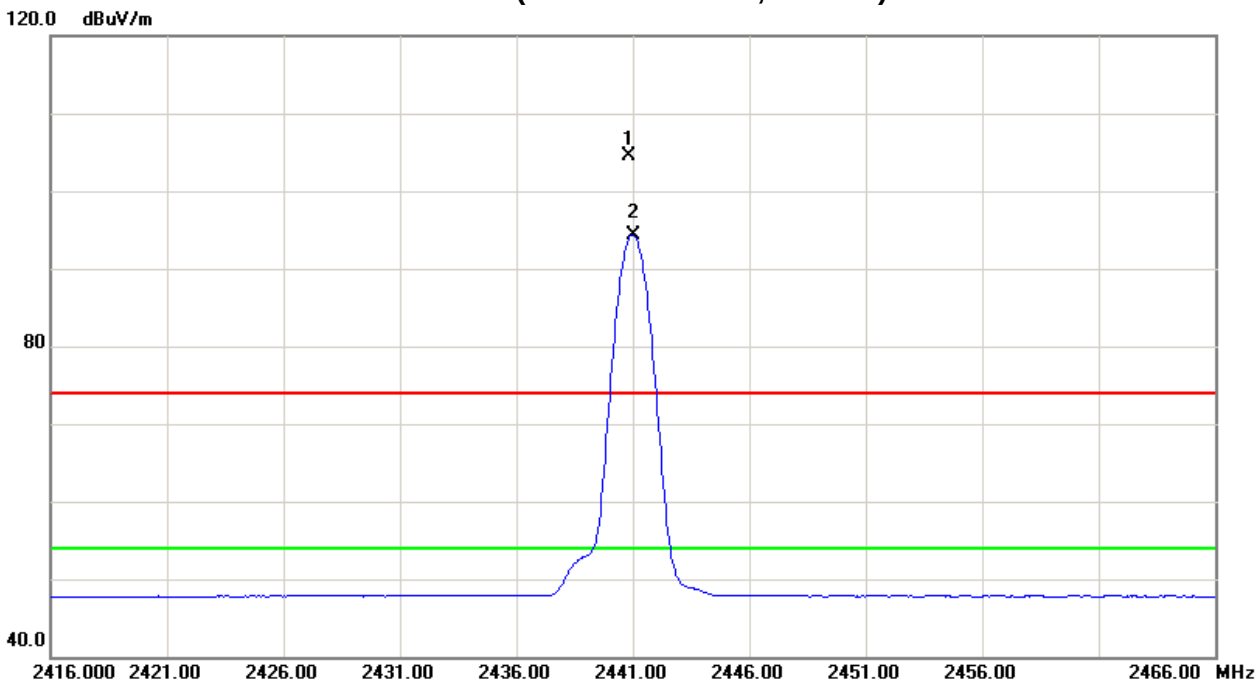


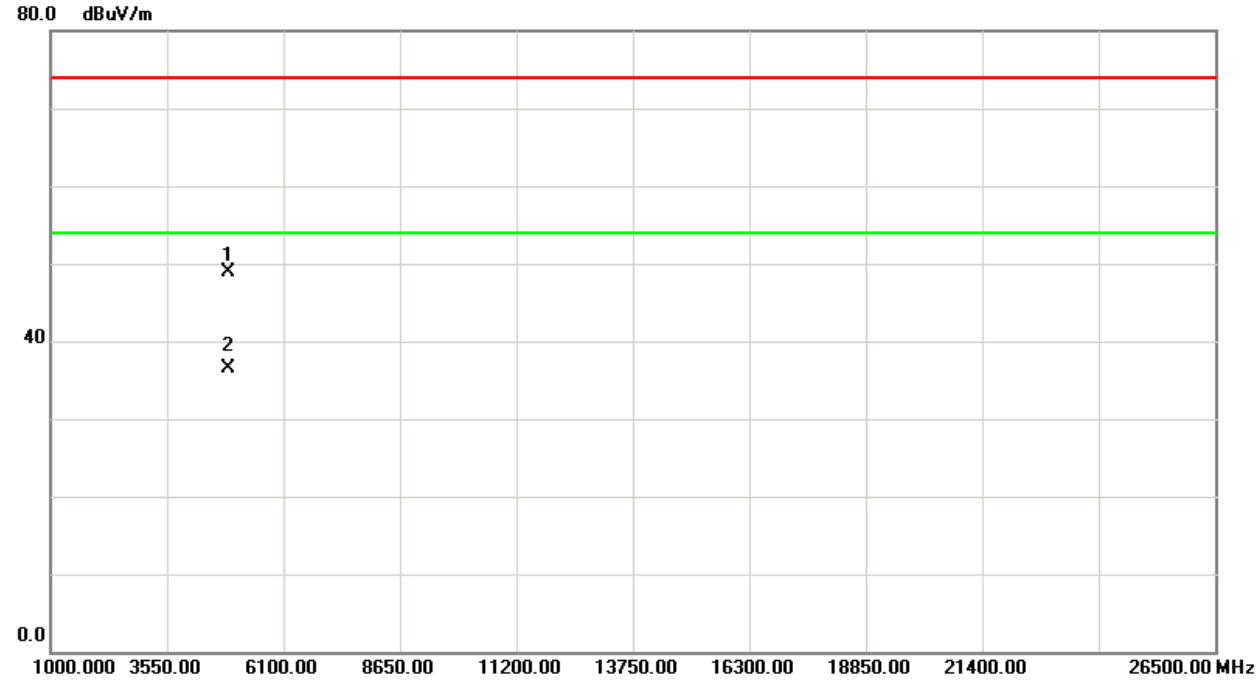
**TX CH00(Above 1000 MHz, Horizontal)**



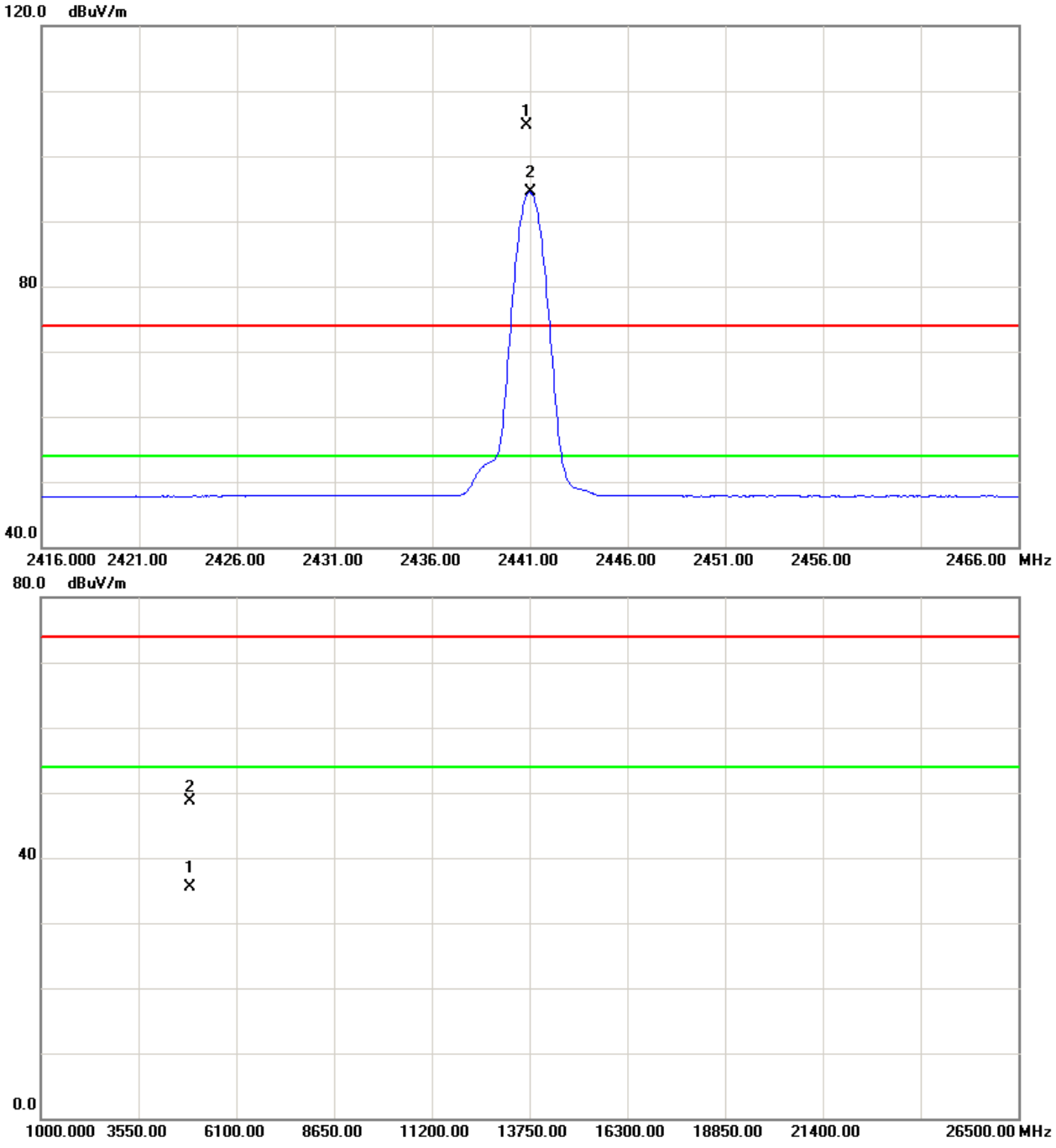



**TX CH39 (Above 1000 MHz, Vertical)**

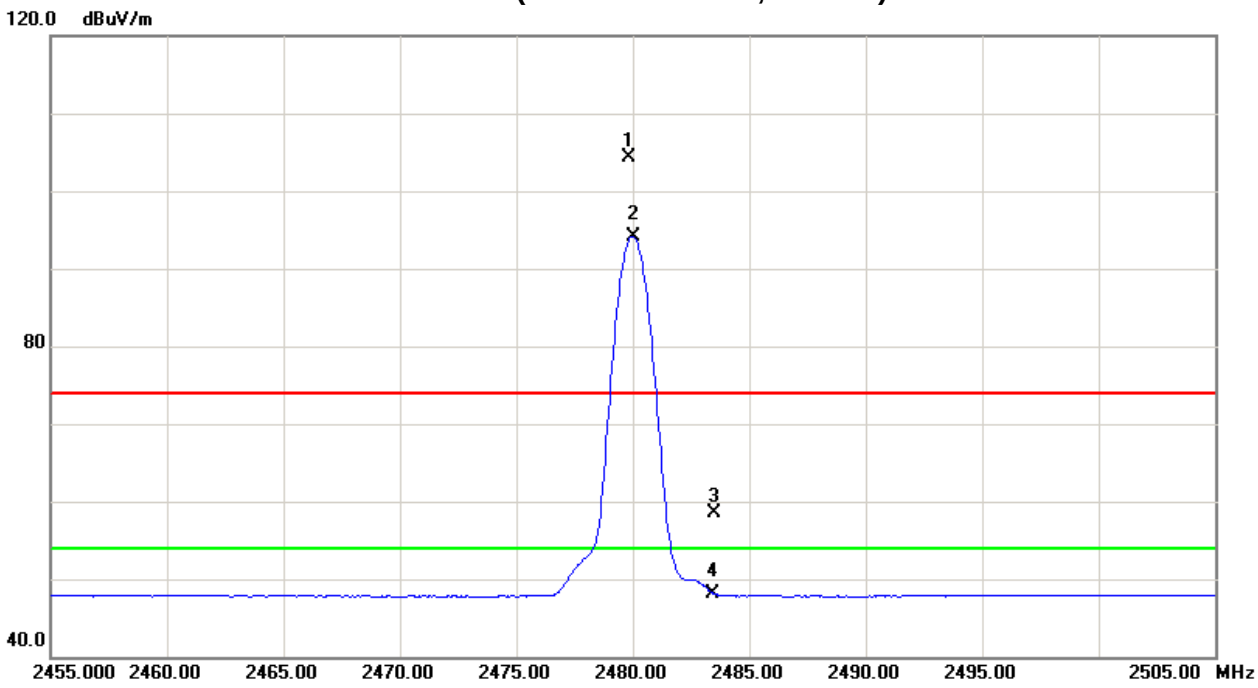


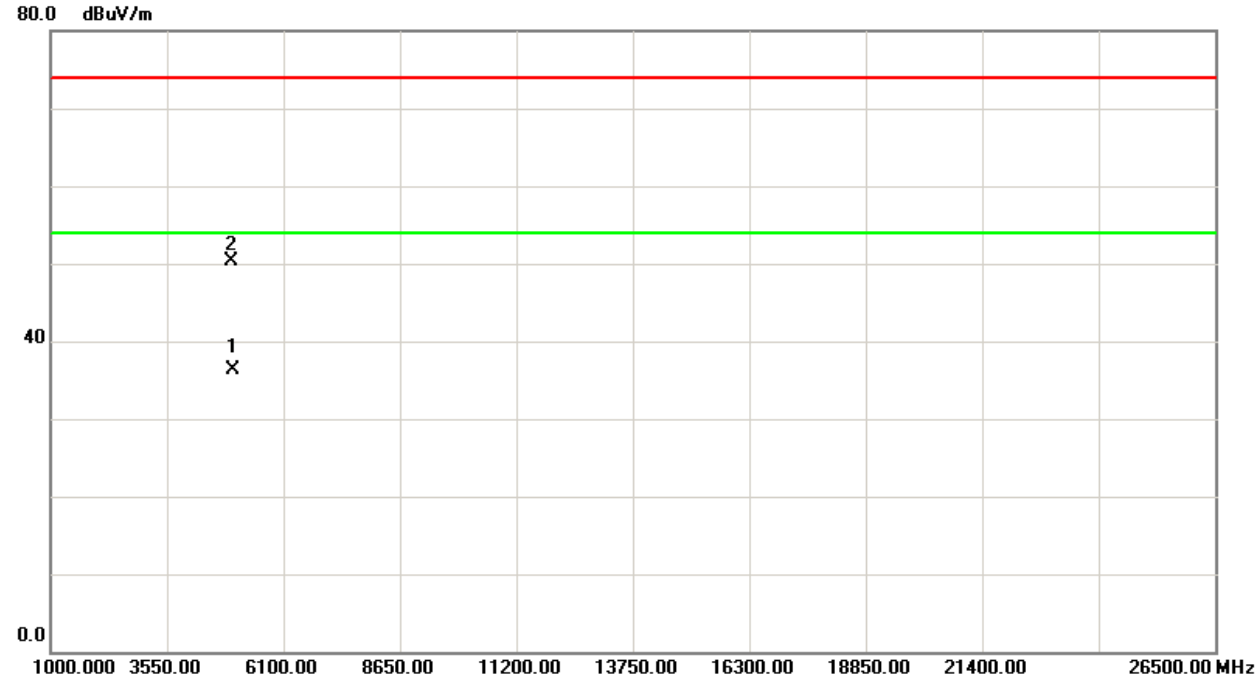



**TX CH39 (Above 1000 MHz, Horizontal)**

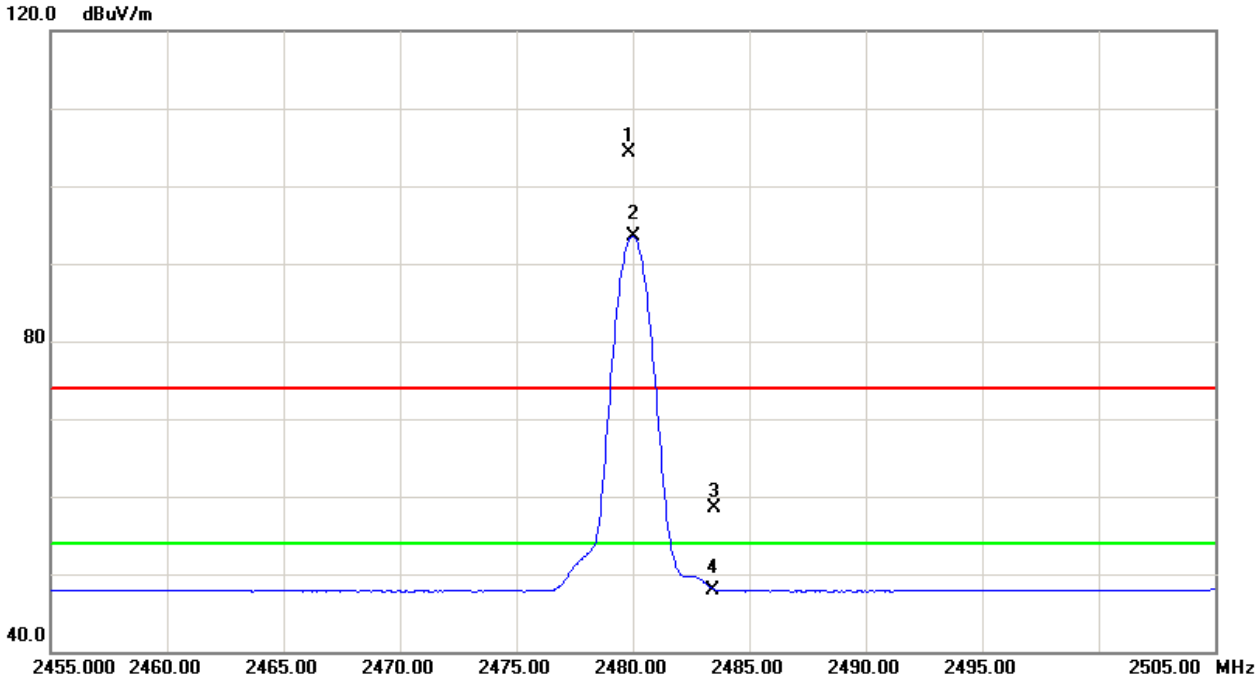


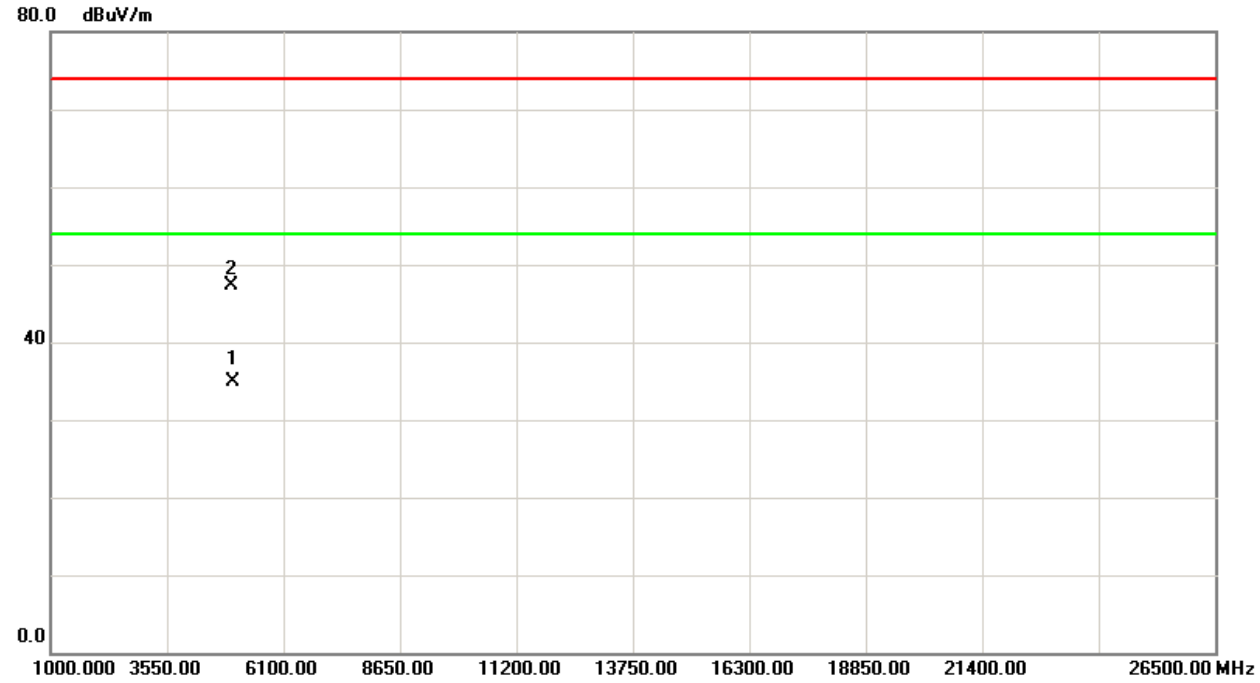
**TX CH78 (Above 1000 MHz, Vertical)**



**TX CH78 (Above 1000 MHz, Horizontal)**



| Test Mode: | TX 2402MHz _CH00_3Mbps |
|---|---|

| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| 2390.00 | V | 24.19 | 13.37 | 34.09 | 58.28 | 47.46 | 74.00 | 54.00 | X/E |
| **2402.05** | **V** | **64.73** | **53.33** | **34.12** | **98.85** | **87.45** | | | **X/F** |
| 4804.95 | V | 42.78 | 30.32 | 6.38 | 49.16 | 36.70 | 74.00 | 54.00 | X/H |

| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| 2390.00 | H | 24.71 | 13.33 | 34.09 | 58.80 | 47.42 | 74.00 | 54.00 | X/E |
| **2402.00** | **H** | **65.56** | **54.01** | **34.12** | **99.68** | **88.13** | | | **X/F** |
| 4804.74 | H | 40.29 | 29.55 | 6.38 | 46.67 | 35.93 | 74.00 | 54.00 | X/H |

| Test Mode: | TX 2441MHz _CH39_3Mbps |
|---|---|

| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| **2440.80** | **V** | **67.38** | **55.79** | **34.25** | **101.63** | **90.04** | | | **X/F** |
| 4882.87 | V | 42.27 | 29.80 | 6.61 | 48.88 | 36.41 | 74.00 | 54.00 | X/H |

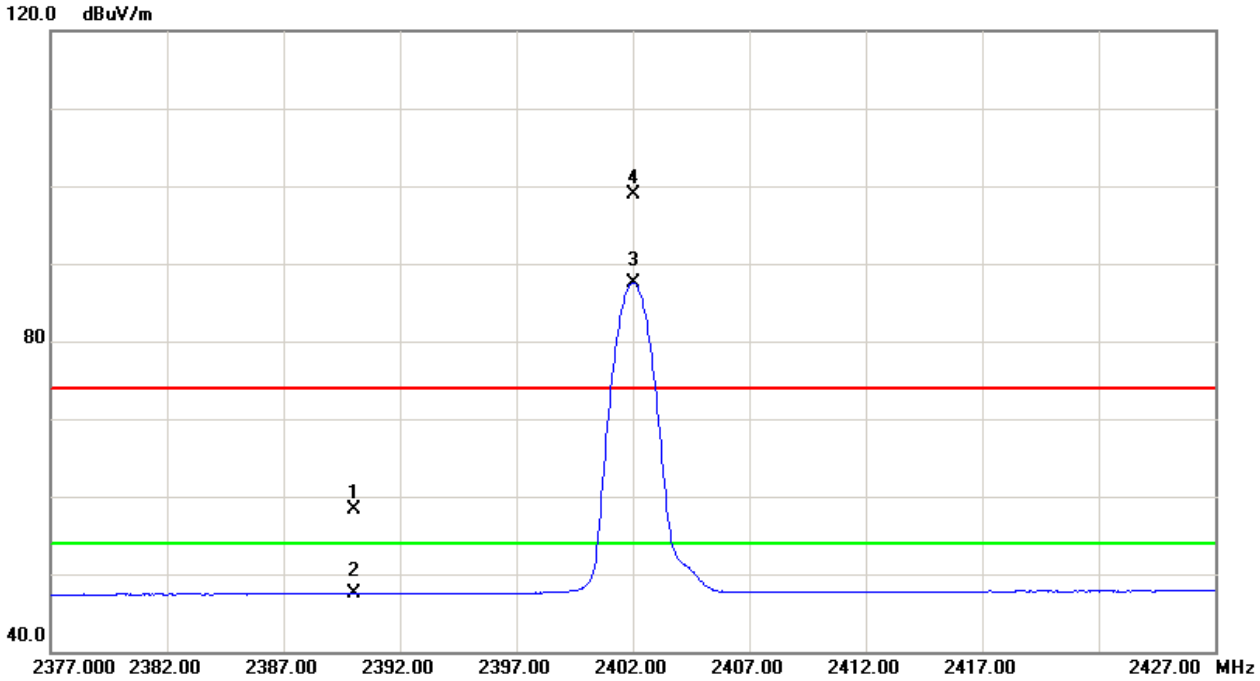
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| **2440.80** | **H** | **67.49** | **56.29** | **34.25** | **101.74** | **90.54** | | | **X/F** |
| 4882.12 | H | 42.25 | 28.97 | 6.61 | 48.86 | 35.58 | 74.00 | 54.00 | X/H |

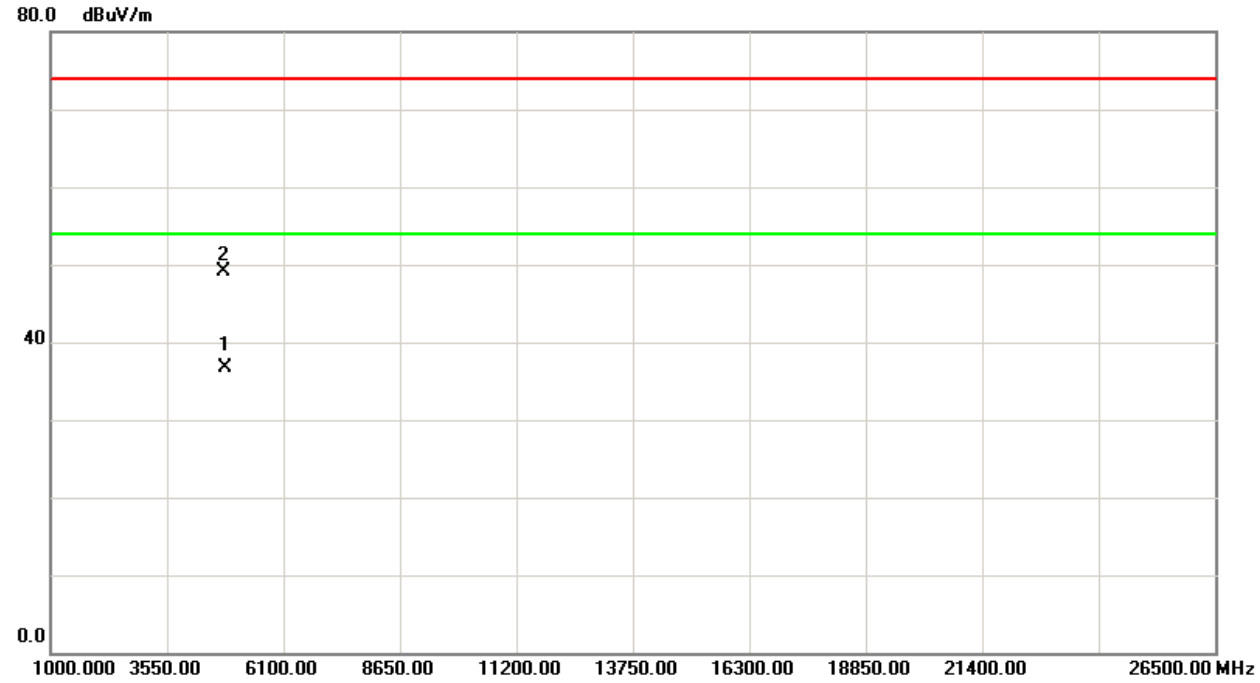
| Test Mode: | TX 2480MHz _CH78_3Mbps |
|---|---|

| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| **2479.80** | **V** | **68.19** | **56.91** | **34.36** | **102.55** | **91.27** | | | **X/F** |
| 2483.50 | V | 23.26 | 13.49 | 34.37 | 57.63 | 47.86 | 74.00 | 54.00 | X/E |
| 4960.00 | V | 42.41 | 28.57 | 6.83 | 49.24 | 35.40 | 74.00 | 54.00 | X/H |

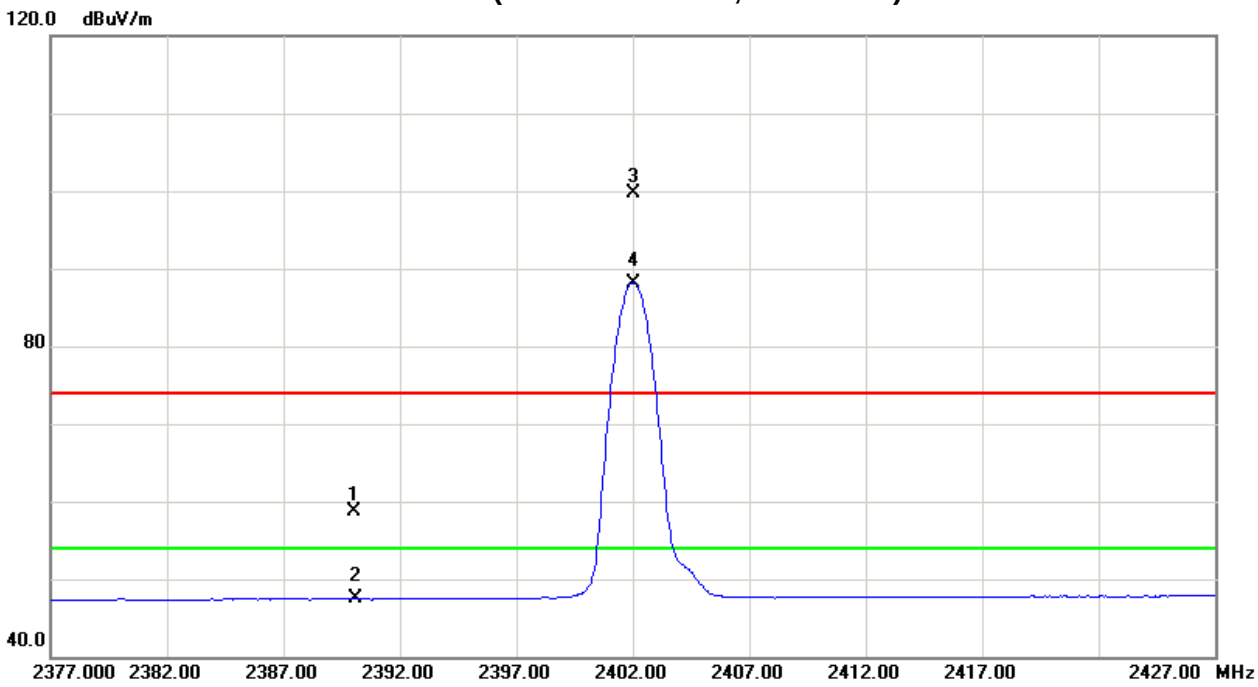
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| **2479.85** | **H** | **67.12** | **55.84** | **34.36** | **101.48** | **90.20** | | | **X/F** |
| 2483.50 | H | 24.82 | 13.51 | 34.37 | 59.19 | 47.88 | 74.00 | 54.00 | X/E |
| 4960.17 | H | 40.37 | 29.18 | 6.83 | 47.20 | 36.01 | 74.00 | 54.00 | X/H |

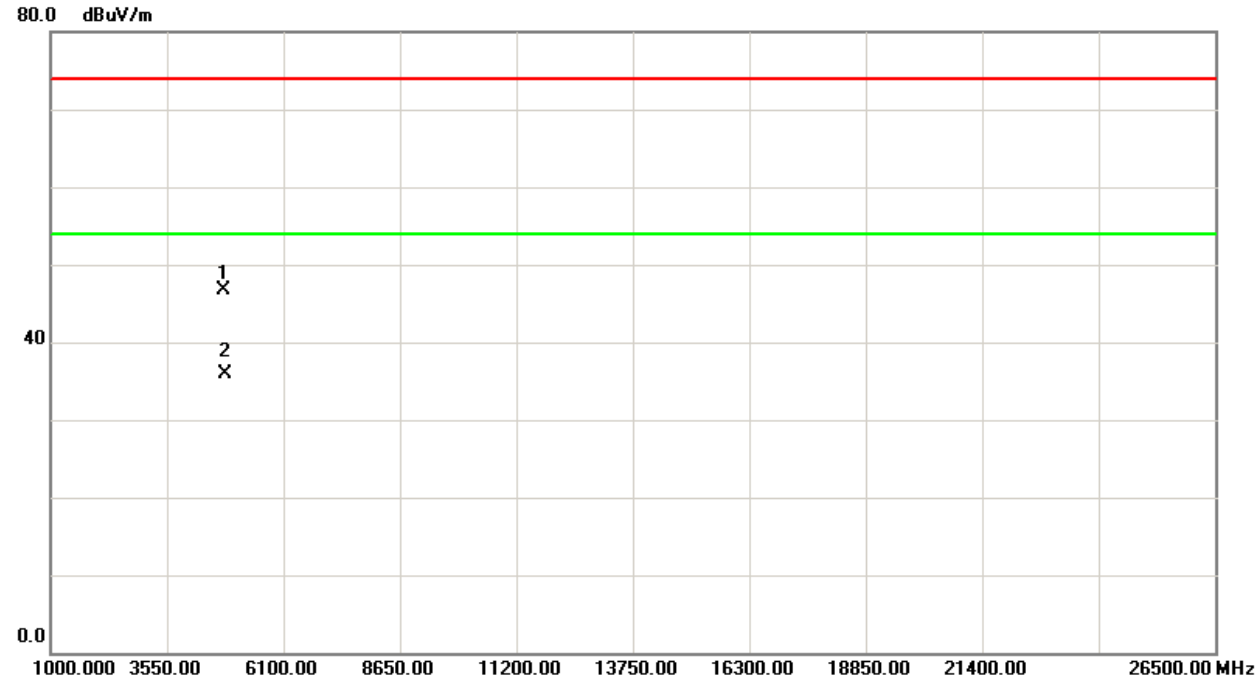
**TX CH00(Above 1000 MHz, Vertical)**



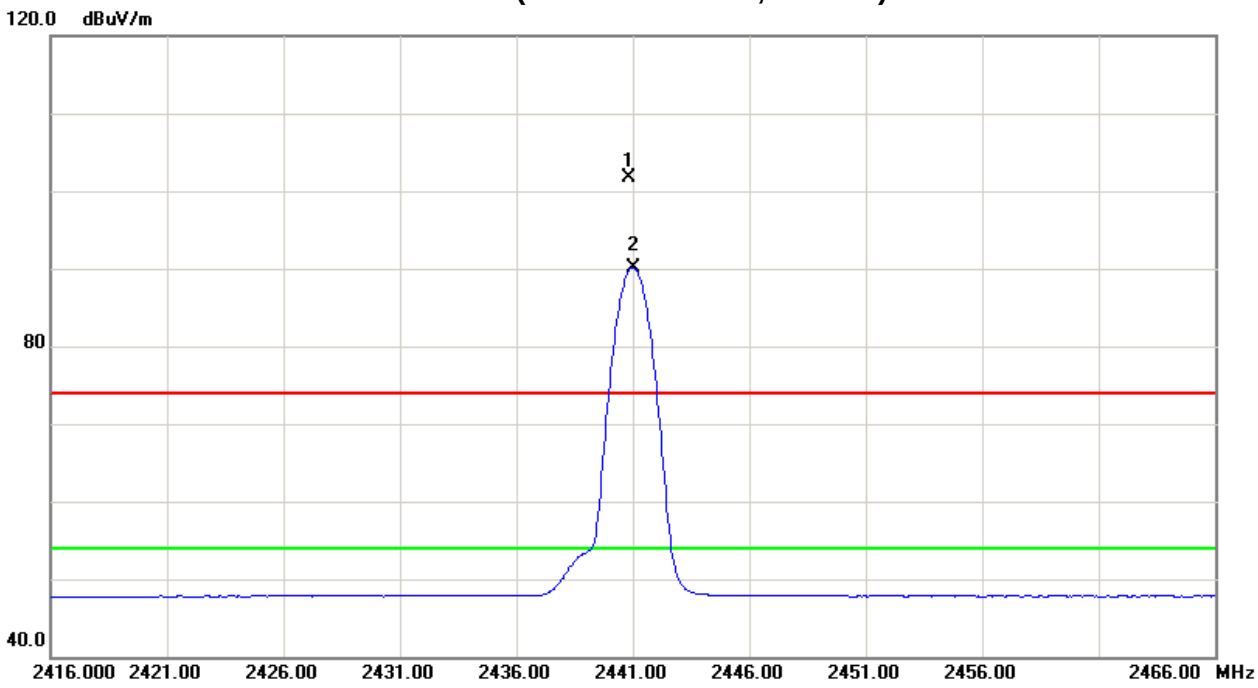



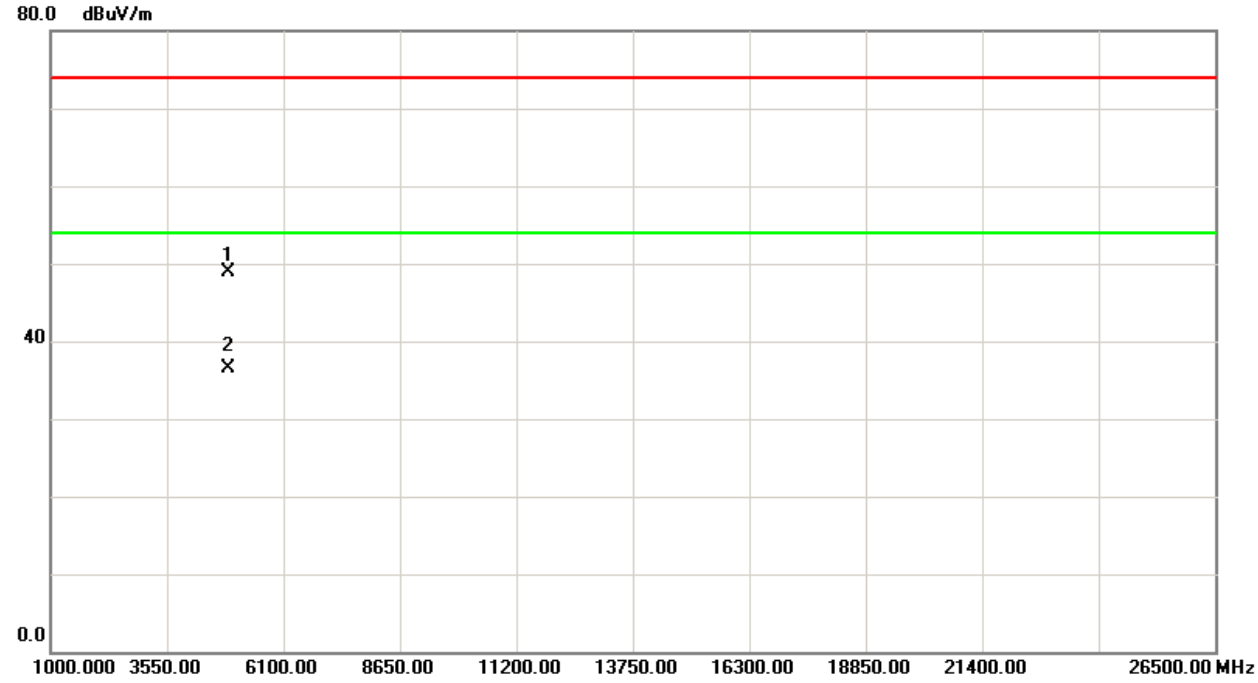
**TX CH00(Above 1000 MHz, Horizontal)**



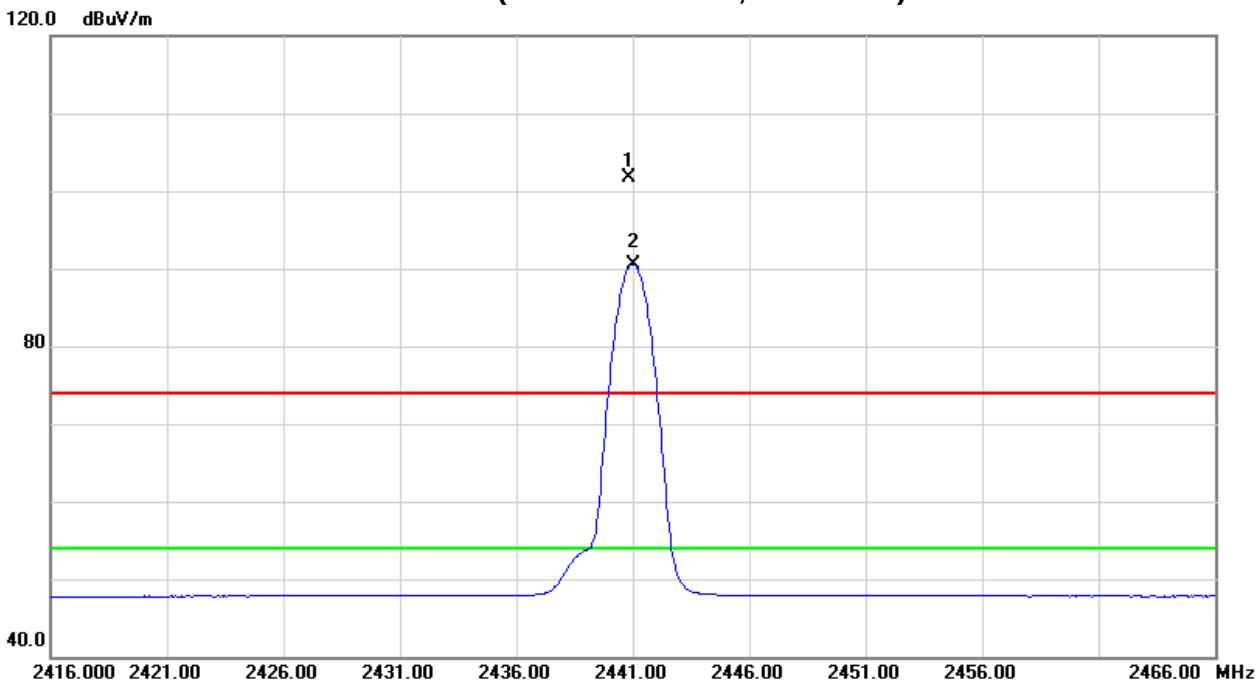



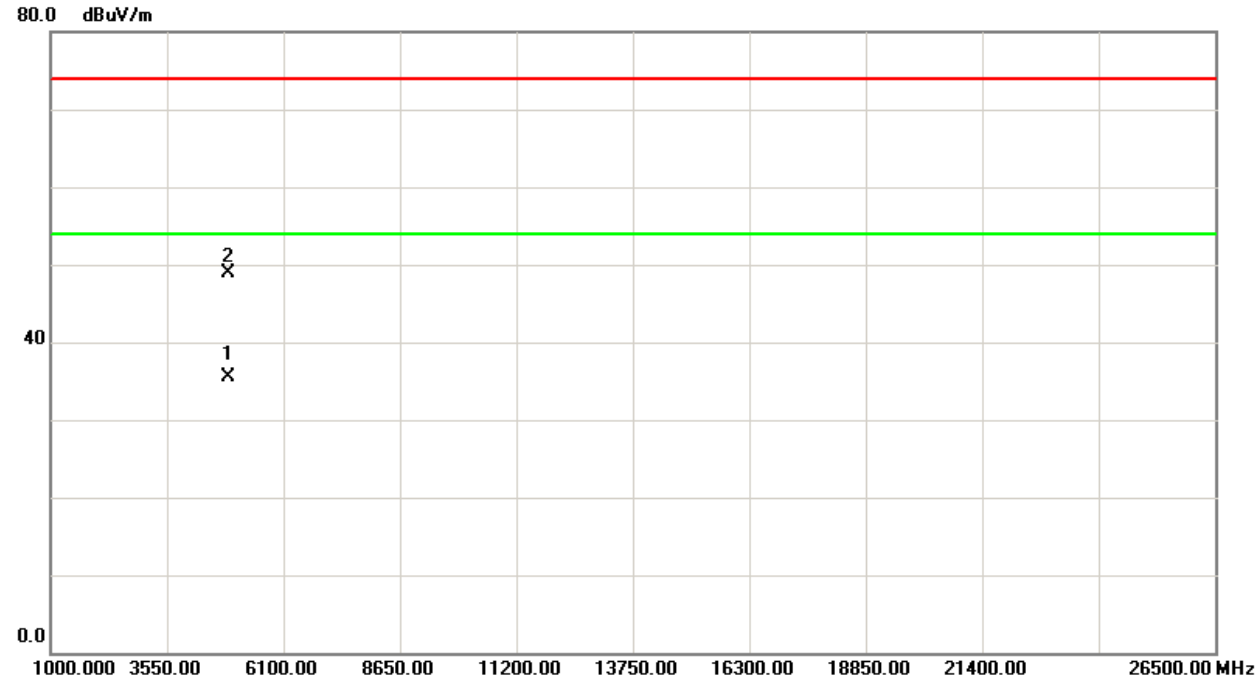
**TX CH39 (Above 1000 MHz, Vertical)**



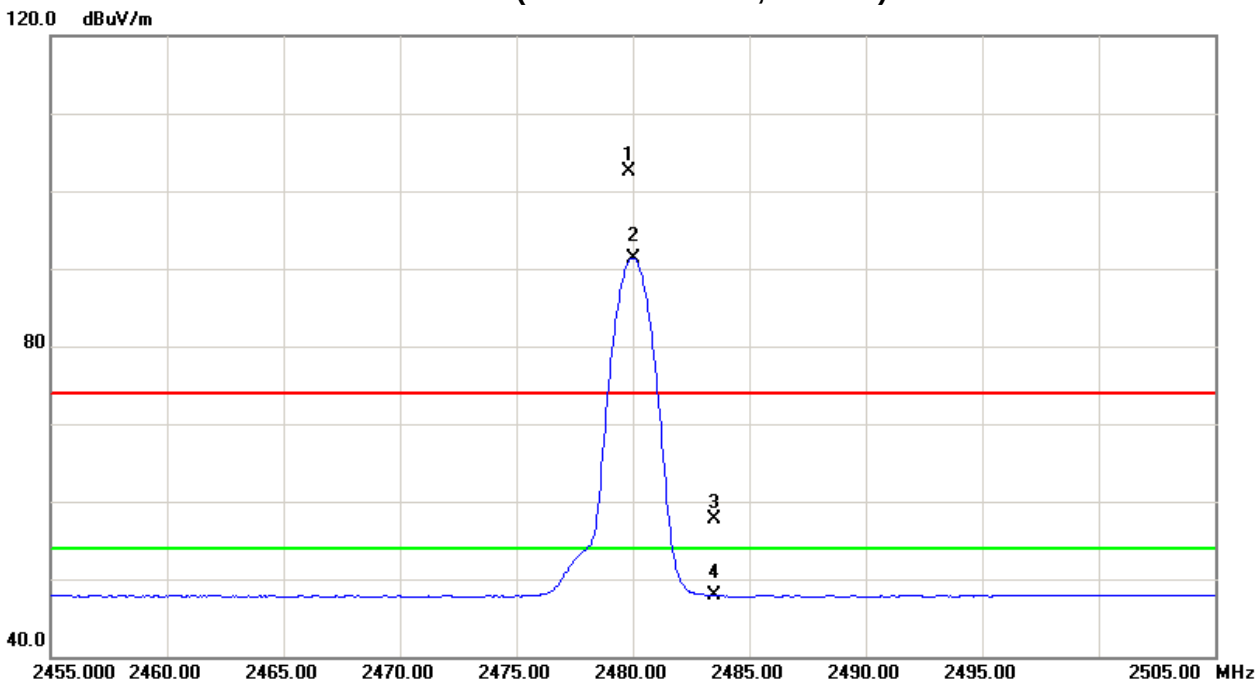



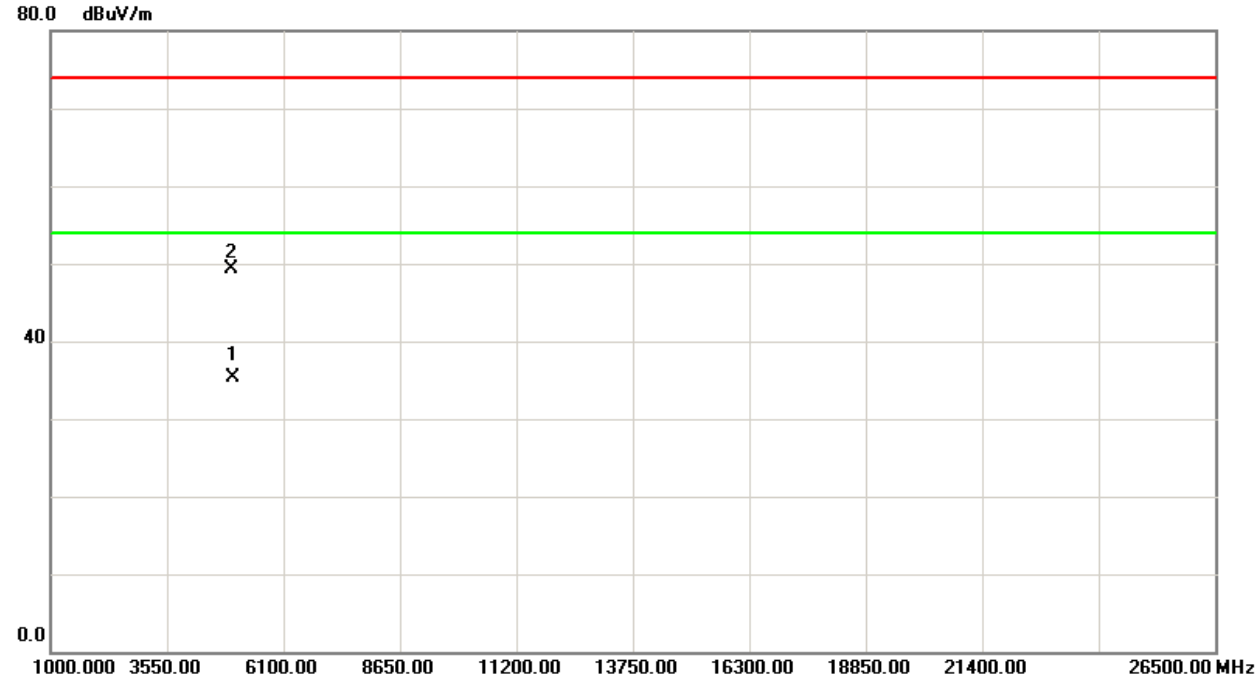
**TX CH39 (Above 1000 MHz, Horizontal)**



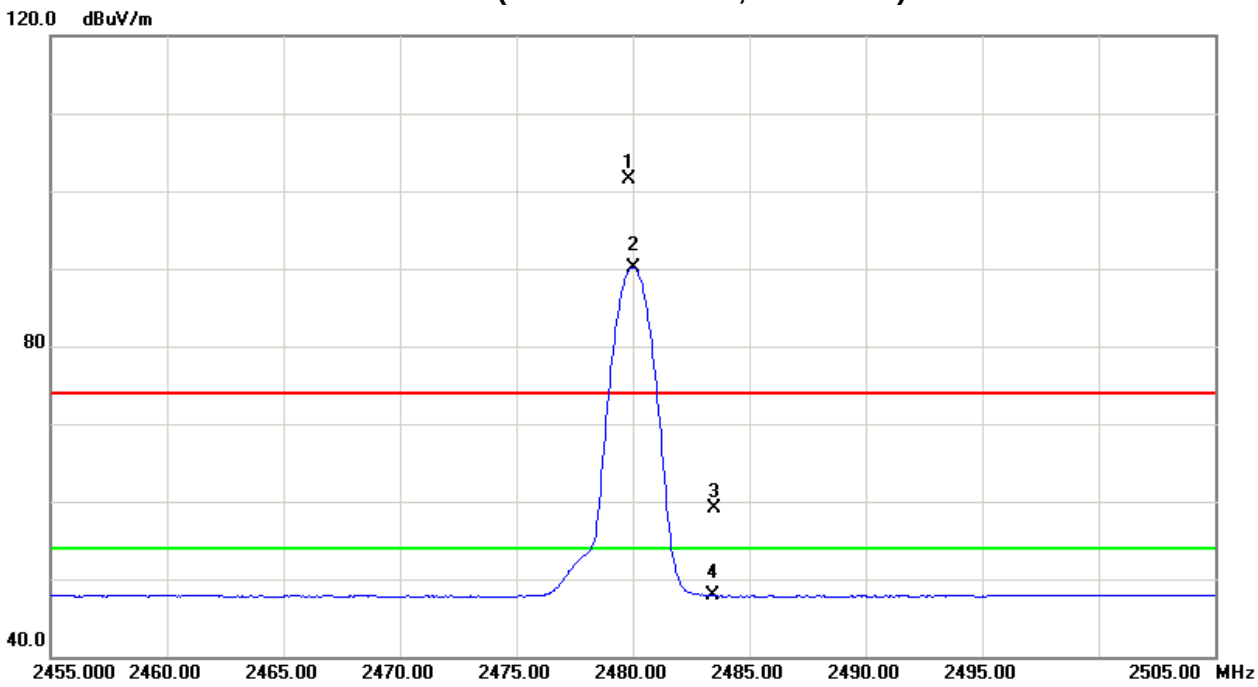



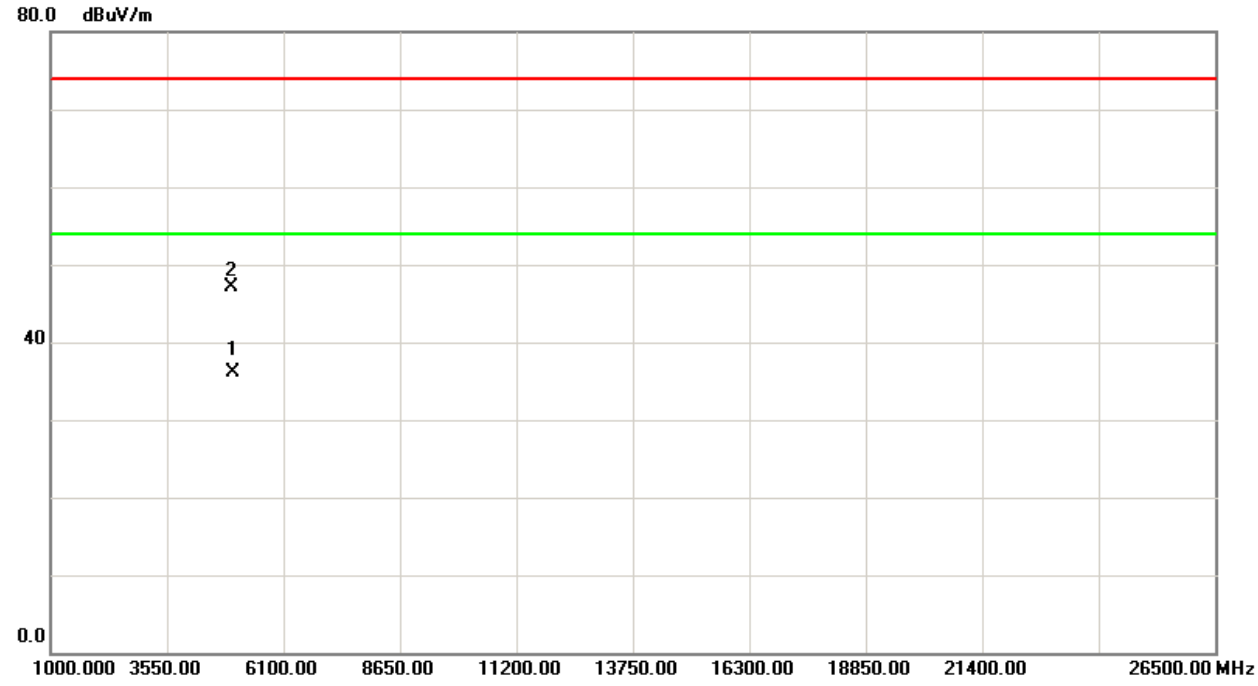
**TX CH78 (Above 1000 MHz, Vertical)**



**TX CH78 (Above 1000 MHz, Horizontal)**



## 5. NUMBER OF HOPPING CHANNEL

### 5.1 APPLIED PROCEDURES

| FCC Part15 (15.247) , Subpart C/ RSS-GEN and RSS-210 | | | |
|---|---|---|---|
| Section | Test Item | Frequency Range (MHz) | Result |
| 15.247(a)(1)(iii) RSS-210, Issue 8, Annex 8, A8.1(d) | Number of Hopping Channel | 2400-2483.5 | PASS |

| Spectrum Parameters | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > Operating Frequency Range |
| RBW | 100 KHz |
| VBW | 100 KHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

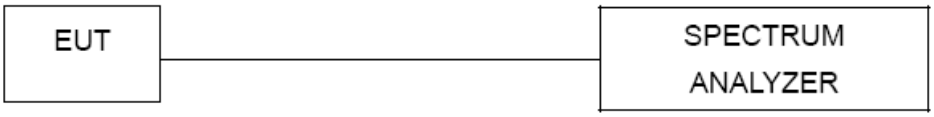
#### 5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW=100KHz, VBW=100KHz, Sweep time = Auto.

#### 5.1.2 DEVIATION FROM STANDARD

No deviation.

#### 5.1.3 TEST SETUP




#### 5.1.4 EUT OPERATION CONDITIONS

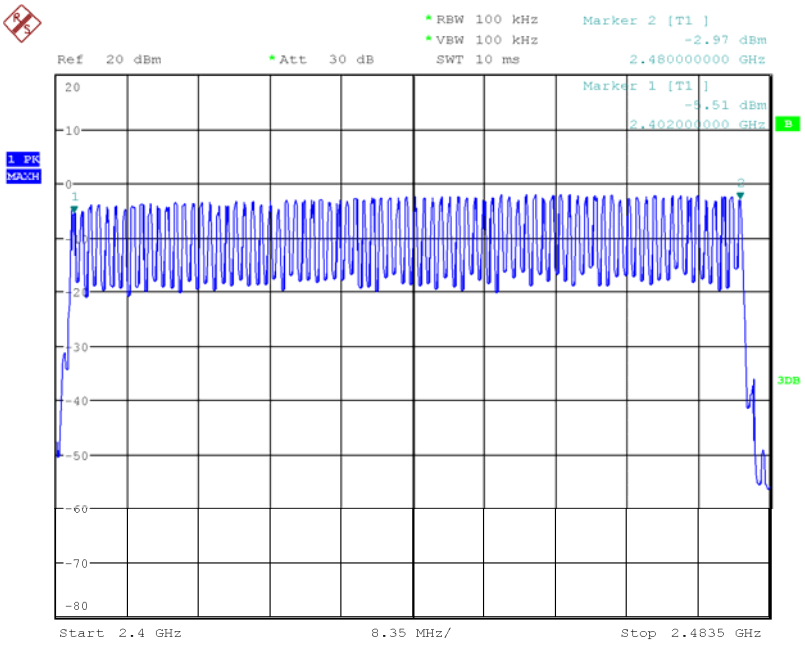
The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

#### 5.1.5 EUT TEST CONDITIONS

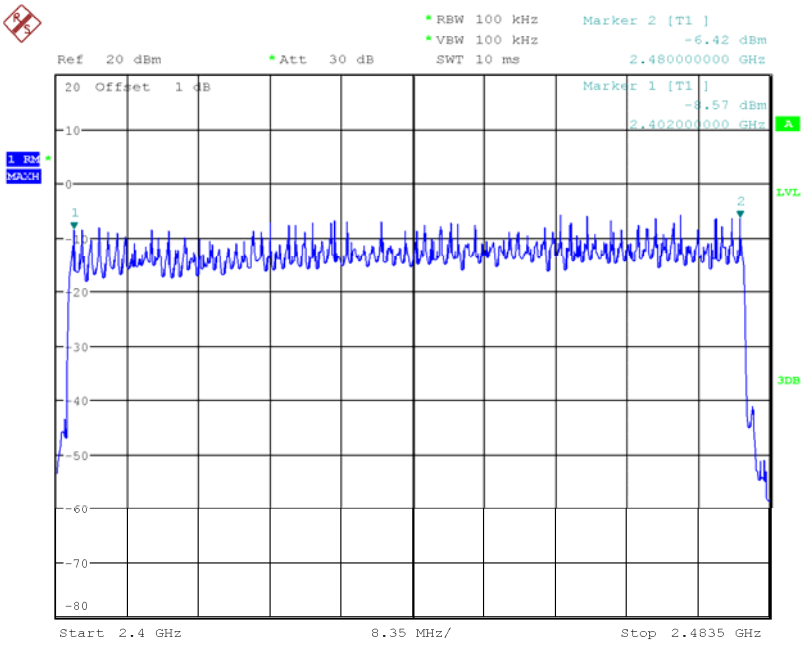
Temperature: 25°C
Relative Humidity: 55%
Test Voltage: 120V/60Hz

### 5.1.6 TEST RESULTS

| Test Mode | Hopping Mode_1Mbps |
|---|---|
| Number of Hopping Channel | 79 |




| Test Mode | Hopping Mode_3Mbps |
|---|---|
| Number of Hopping Channel | 79 |



# 6. AVERAGE TIME OF OCCUPANCY

## 6.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C/ RSS-GEN and RSS-210 | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(a)(1)(iii) RSS-210, Issue 8, Annex 8, A8.1(d) | Average Time of Occupancy | 0.4sec | 2400-2483.5 | PASS |

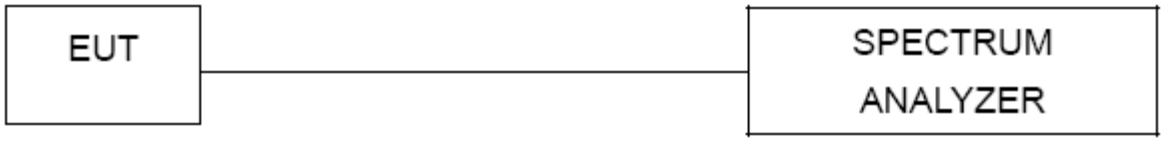
### 6.1.1 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.
g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
h. Measure the maximum time duration of one single pulse.
i. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds.
j. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 5.06 x 31.6 = 160 within 31.6 seconds.
k. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times 10.12 x 31.6 = 320 within 31.6 seconds.

### 6.1.2 DEVIATION FROM STANDARD

No deviation.

### 6.1.3 TEST SETUP



### 6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

### 6.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: 120V/60Hz

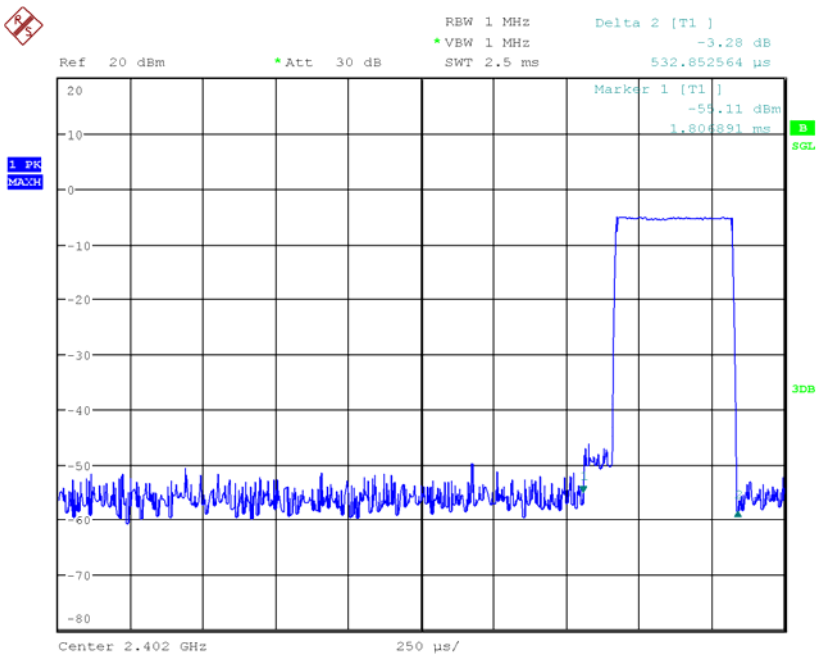
### 6.1.6 TEST RESULTS

| Test Mode: CH00_1Mbps | | | | |
|---|---|---|---|---|
| **Data Packet** | **Frequency (MHz)** | **Pulse Duration (ms)** | **Dwell Time (s)** | **Limits (s)** |
| DH5 | 2402 | 3.0929 | 0.3299 | 0.4000 |
| DH3 | 2402 | 1.8149 | 0.2904 | 0.4000 |
| DH1 | 2402 | 0.5329 | 0.1705 | 0.4000 |

| Test Mode: CH39_1Mbps | | | | |
|---|---|---|---|---|
| **Data Packet** | **Frequency (MHz)** | **Pulse Duration (ms)** | **Dwell Time (s)** | **Limits (s)** |
| DH5 | 2441 | 3.0769 | 0.3282 | 0.4000 |
| DH3 | 2441 | 1.8269 | 0.2923 | 0.4000 |
| DH1 | 2441 | 0.5369 | 0.1718 | 0.4000 |

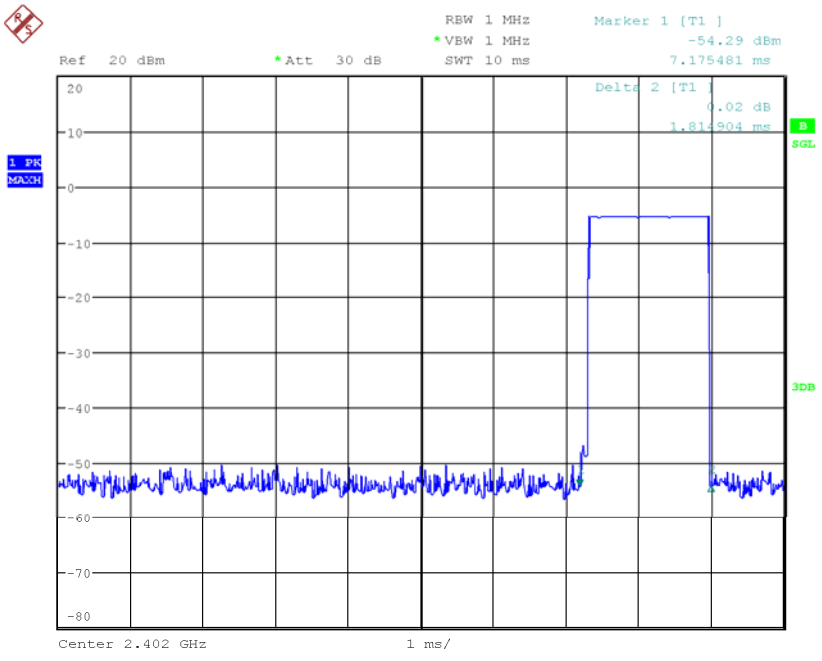
| Test Mode: CH78_1Mbps | | | | |
|---|---|---|---|---|
| **Data Packet** | **Frequency (MHz)** | **Pulse Duration (ms)** | **Dwell Time (s)** | **Limits (s)** |
| DH5 | 2480 | 3.0769 | 0.3282 | 0.4000 |
| DH3 | 2480 | 1.8269 | 0.2923 | 0.4000 |
| DH1 | 2480 | 0.5329 | 0.1705 | 0.4000 |

## CH00-DH1



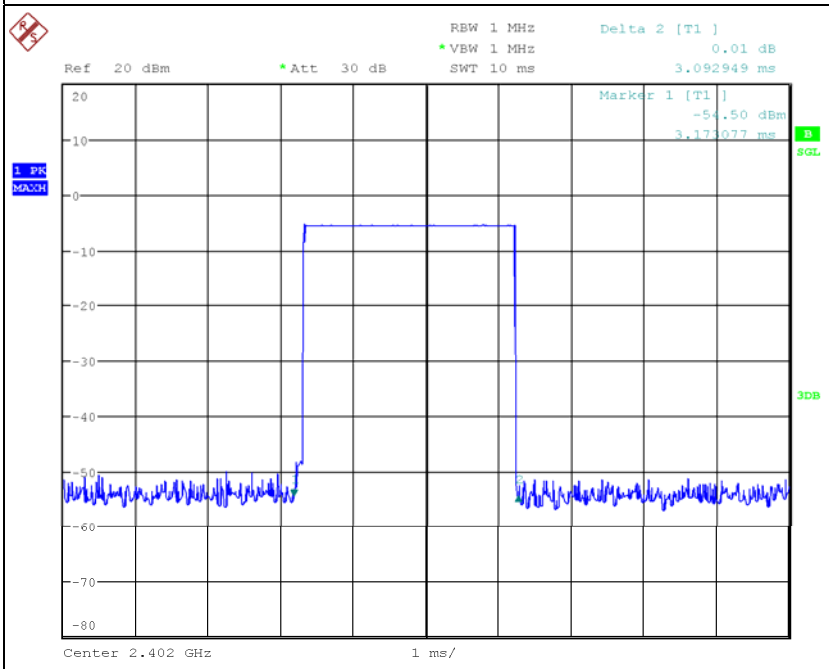

Date: 10.JAN.2014 14:15:45

## CH00-DH3



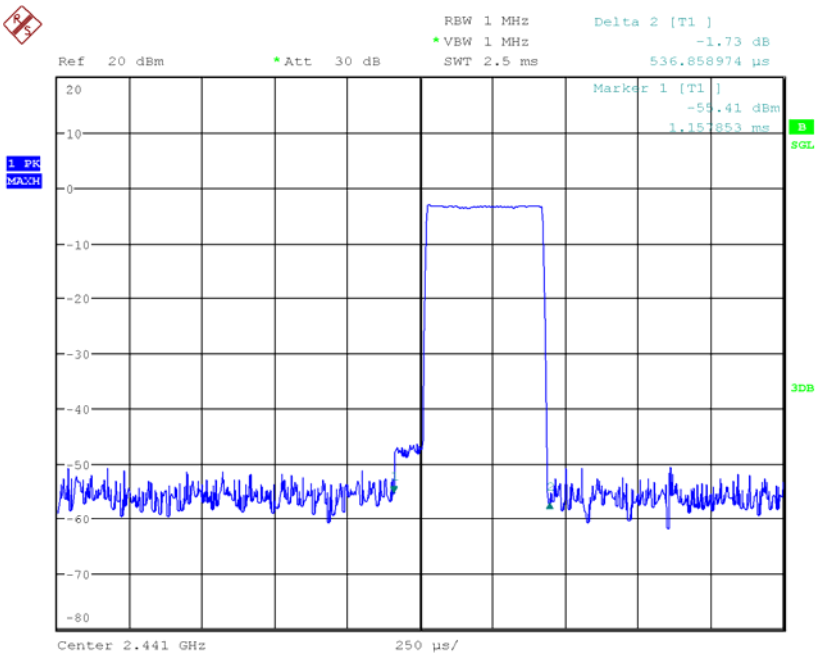

Date: 10.JAN.2014 14:20:23

**CH00-DH5**



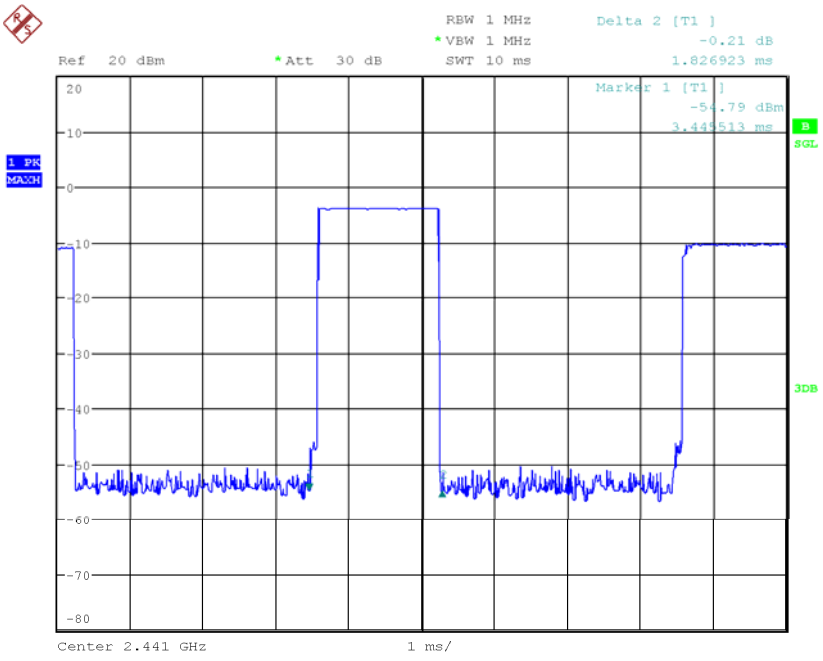

Date: 10.JAN.2014 14:21:53

**CH39-DH1**



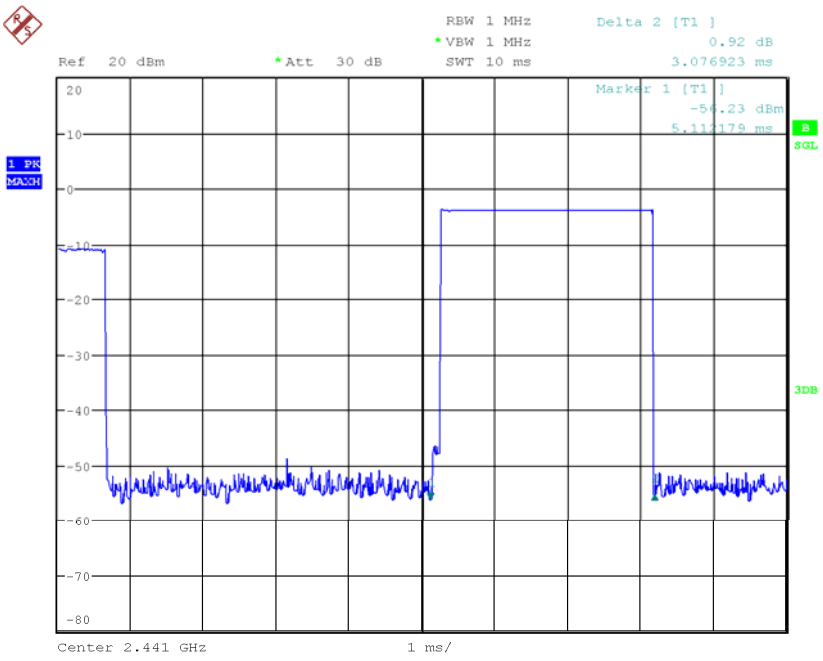

Date: 10.JAN.2014 14:27:43

## CH39-DH3



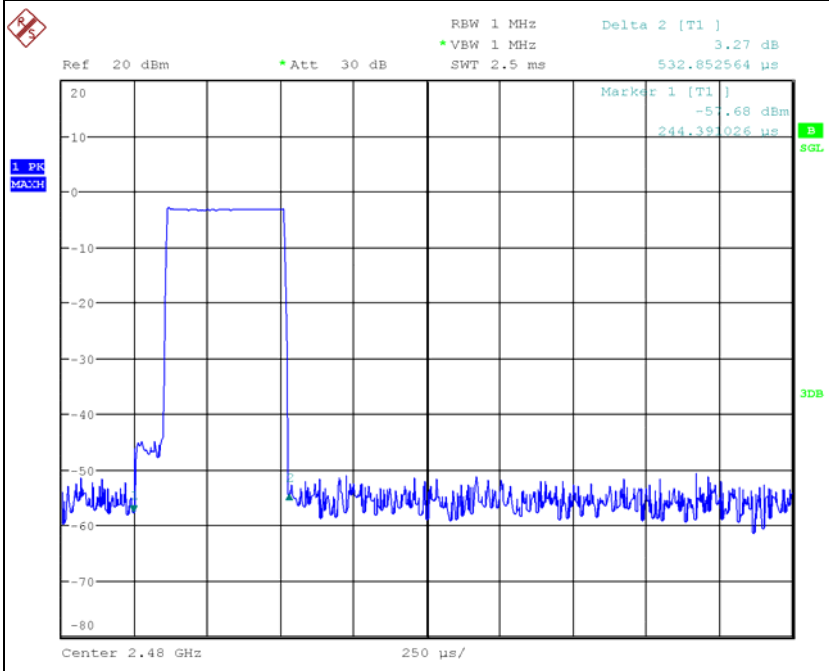

Date: 10.JAN.2014 14:26:19

## CH39-DH5



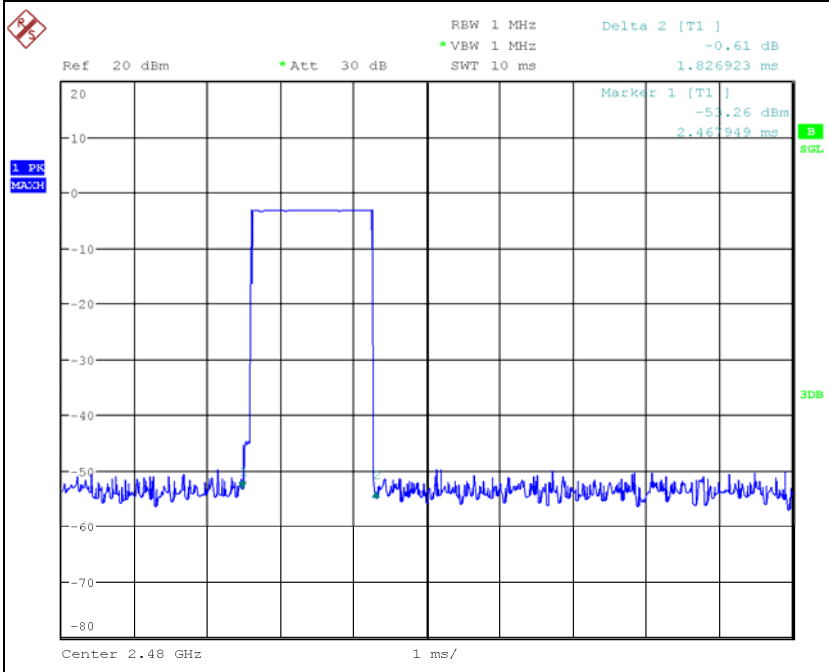

Date: 10.JAN.2014 14:24:07

**CH78-DH1**



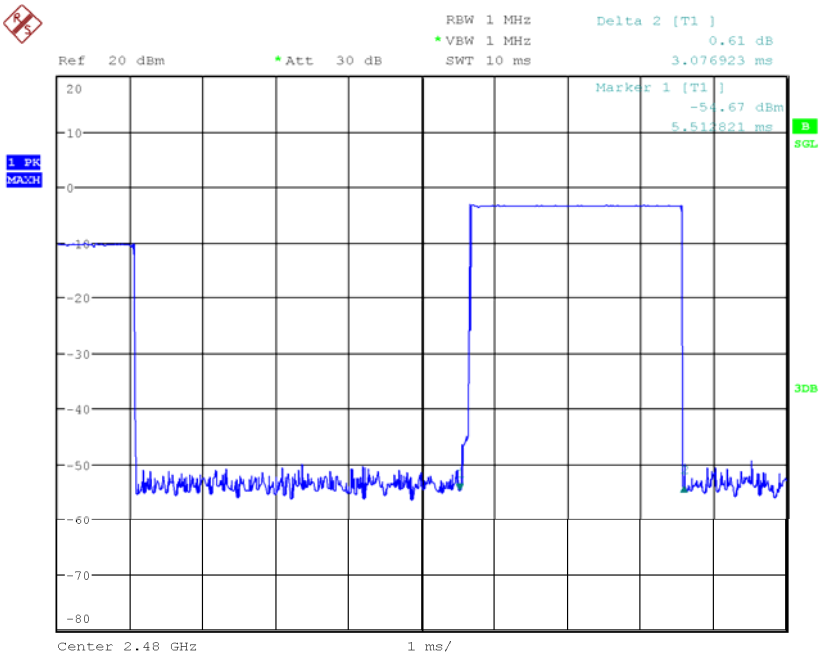

Date: 10.JAN.2014 14:29:13

**CH78-DH3**




Date: 10.JAN.2014 14:30:38

## CH78-DH5

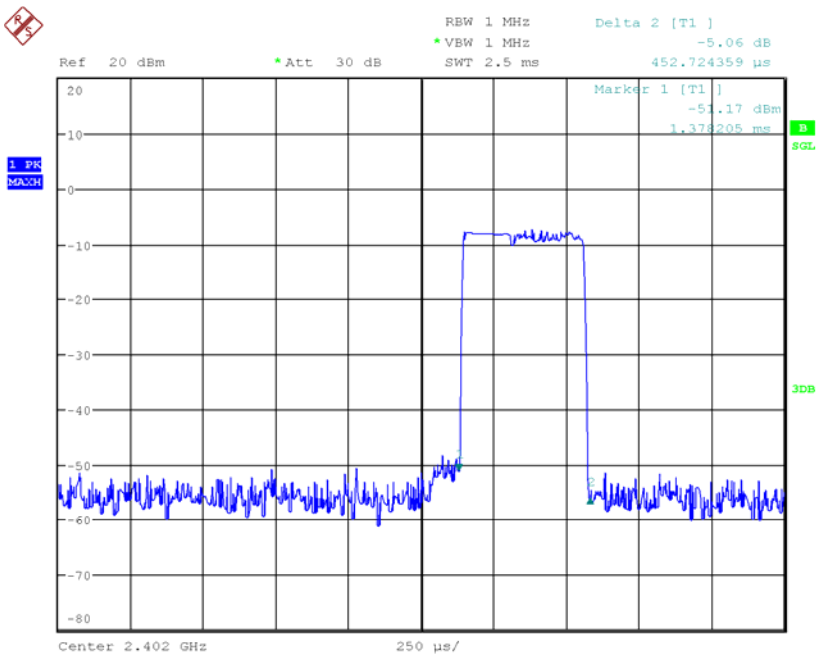

RBW 1 MHz
VBW 1 MHz
SWT 10 ms
Delta 2 [T1 ]
0.61 dB
3.076923 ms
Ref 20 dBm
Att 30 dB
Marker 1 [T1 ]
-54.67 dBm
5.512821 ms
1 PK
MAXH
B
SGL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.48 GHz
1 ms/
Date: 10.JAN.2014 14:32:32

| Test Mode: CH00_3Mbps | | | | |
|---|---|---|---|---|
| **Data Packet** | **Frequency (MHz)** | **Pulse Duration (ms)** | **Dwell Time (s)** | **Limits (s)** |
| DH5 | 2402 | 3.0609 | 0.3265 | 0.4000 |
| DH3 | 2402 | 1.8109 | 0.2897 | 0.4000 |
| DH1 | 2402 | 0.4527 | 0.1449 | 0.4000 |

| Test Mode: CH39_3Mbps | | | | |
|---|---|---|---|---|
| **Data Packet** | **Frequency (MHz)** | **Pulse Duration (ms)** | **Dwell Time (s)** | **Limits (s)** |
| DH5 | 2441 | 3.0769 | 0.3282 | 0.4000 |
| DH3 | 2441 | 1.8109 | 0.2897 | 0.4000 |
| DH1 | 2441 | 0.5449 | 0.1744 | 0.4000 |

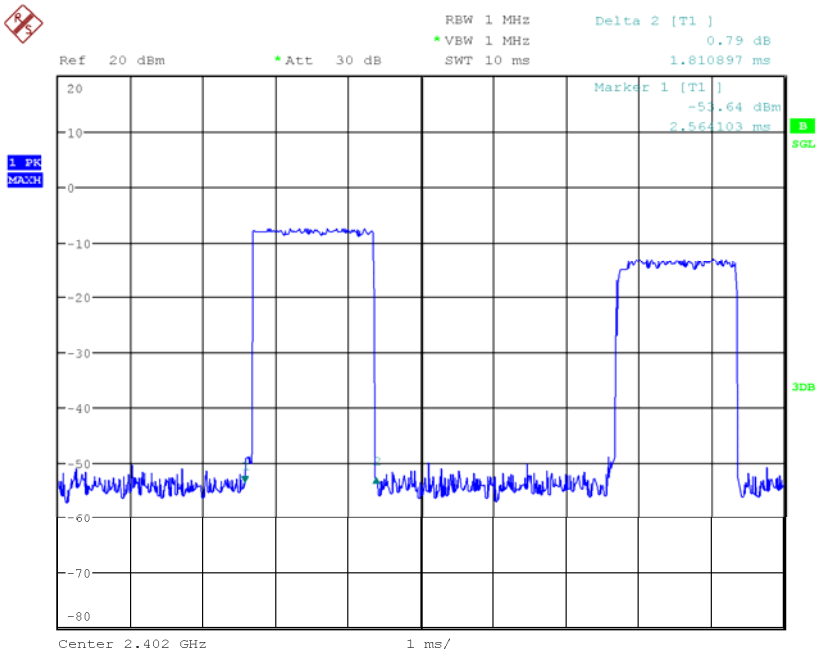
| Test Mode: CH78_3Mbps | | | | |
|---|---|---|---|---|
| **Data Packet** | **Frequency (MHz)** | **Pulse Duration (ms)** | **Dwell Time (s)** | **Limits (s)** |
| DH5 | 2480 | 3.0929 | 0.3299 | 0.4000 |
| DH3 | 2480 | 1.8109 | 0.2897 | 0.4000 |
| DH1 | 2480 | 0.5529 | 0.1769 | 0.4000 |

## CH00-DH1



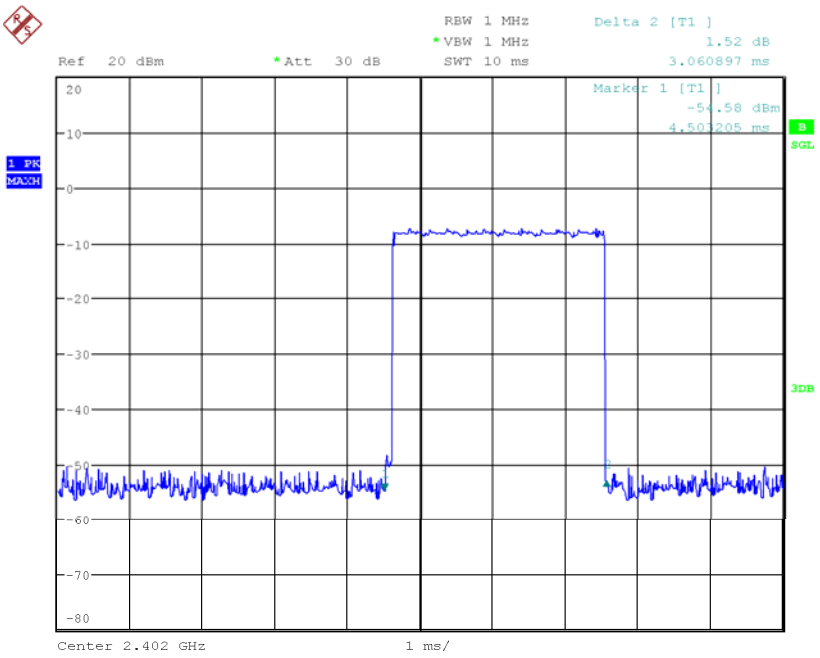

Date: 10.JAN.2014 14:52:47

## CH00-DH3



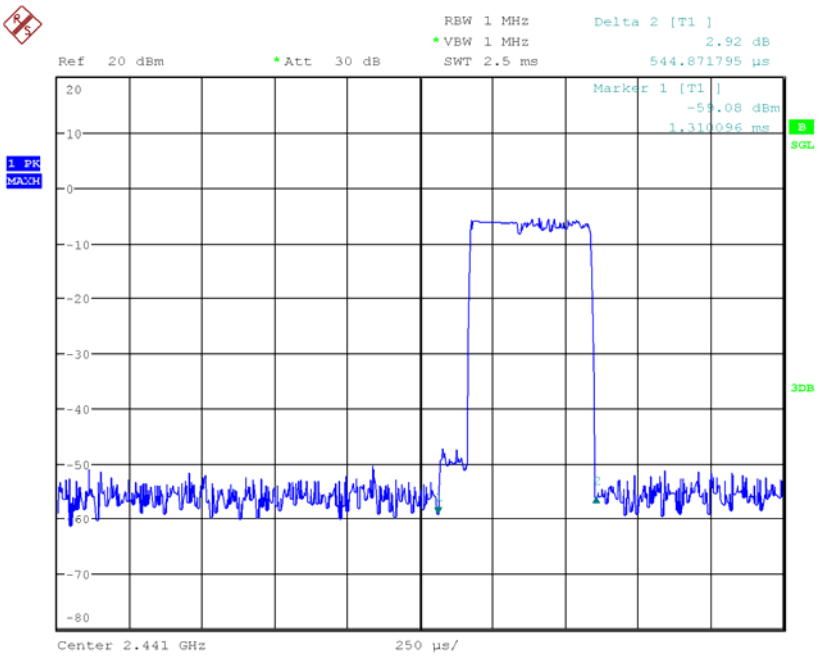

Date: 10.JAN.2014 14:55:00

**CH00-DH5**



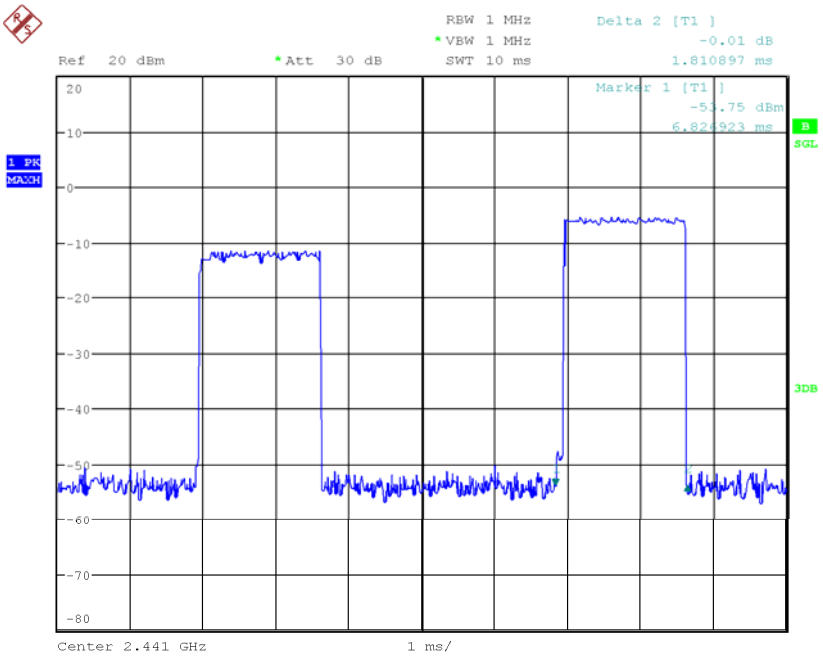

Date: 10.JAN.2014 14:56:51

**CH39-DH1**



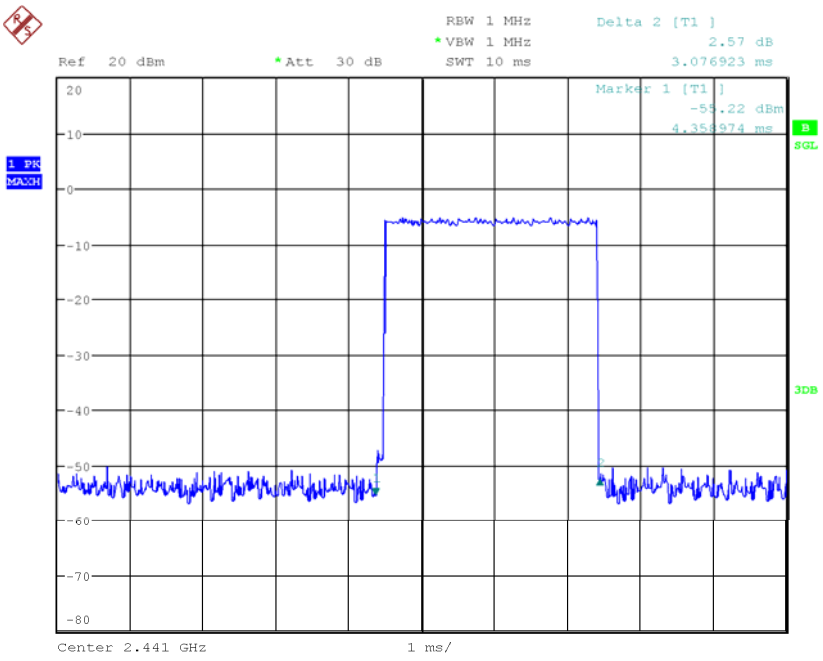

Date: 10.JAN.2014 14:50:35

## CH39-DH3



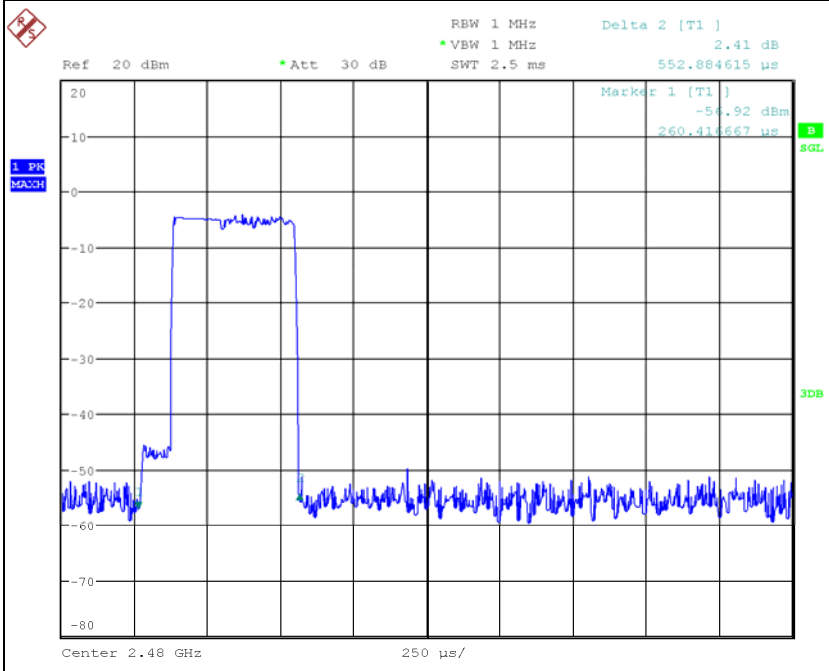

Date: 10.JAN.2014 14:49:25

## CH39-DH5



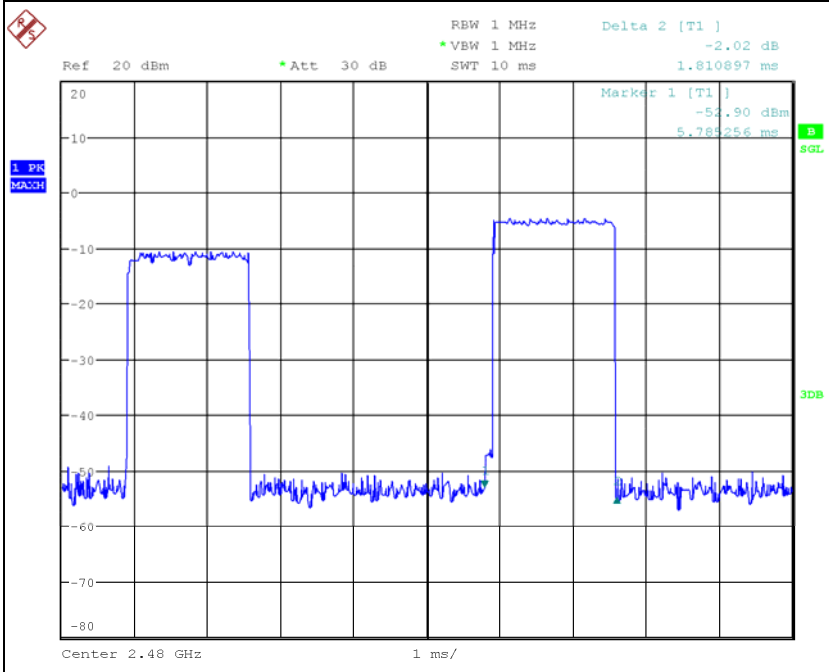

Date: 10.JAN.2014 14:48:04

## CH78-DH1



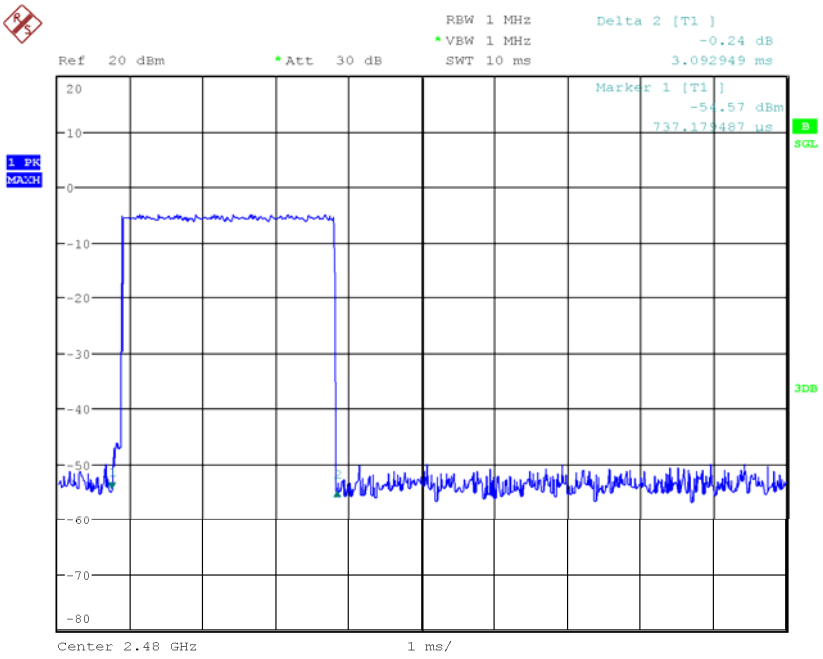

Date: 10.JAN.2014 14:43:45

## CH78-DH3




Date: 10.JAN.2014 14:45:20

## CH78-DH5


RBW 1 MHz
VBW 1 MHz
SWT 10 ms
Delta 2 [T1 ]
-0.24 dB
3.092949 ms
Ref 20 dBm
Att 30 dB
Marker 1 [T1 ]
-54.57 dBm
737.179487 µs
1 PK
MAXH
B
SGL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.48 GHz
1 ms/
Date: 10.JAN.2014 14:46:50

# 7. HOPPING CHANNEL SEPARATION MEASUREMENT

## 7.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 KHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > Measurement Bandwidth or Channel Separation |
| RBW | 30 KHz |
| VBW | 100 KHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

### 7.1.1 TEST PROCEDURE

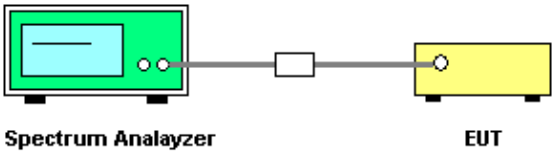
a. The EUT must have its hopping function enabled

b. Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ RBW
Sweep = Auto
Detector function = Peak
Trace = Max Hold

### 7.1.2 DEVIATION FROM STANDARD

No deviation.

### 7.1.3 TEST SETUP



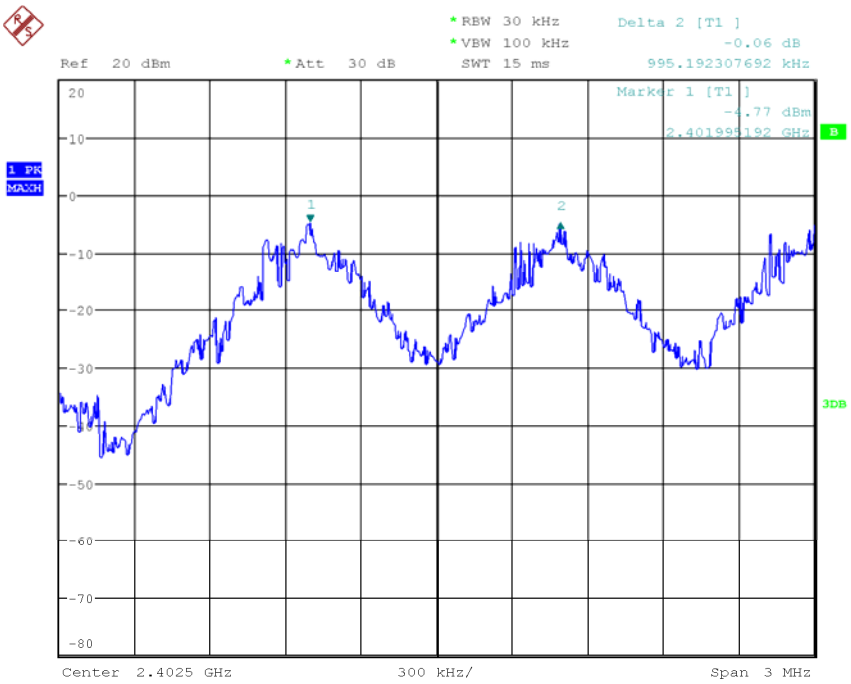

### 7.1.4 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: 120V/60Hz

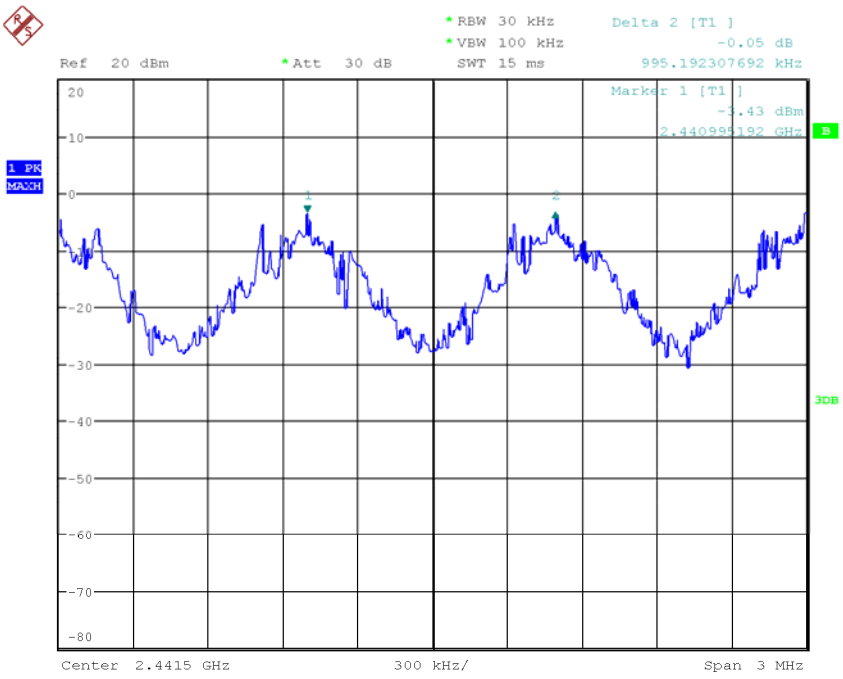
### 7.1.5 TEST RESULTS

| Test Mode: Hopping on_1Mbps | | | |
|---|---|---|---|
| **Frequency (MHz)** | **Ch. Separation (MHz)** | **2/3 of the 20 dB bandwidth (MHz)** | **Result** |
| 2402 | 0.995 | 0.582 | **Complies** |
| 2441 | 0.995 | 0.566 | **Complies** |
| 2480 | 0.990 | 0.572 | **Complies** |

**CH00**

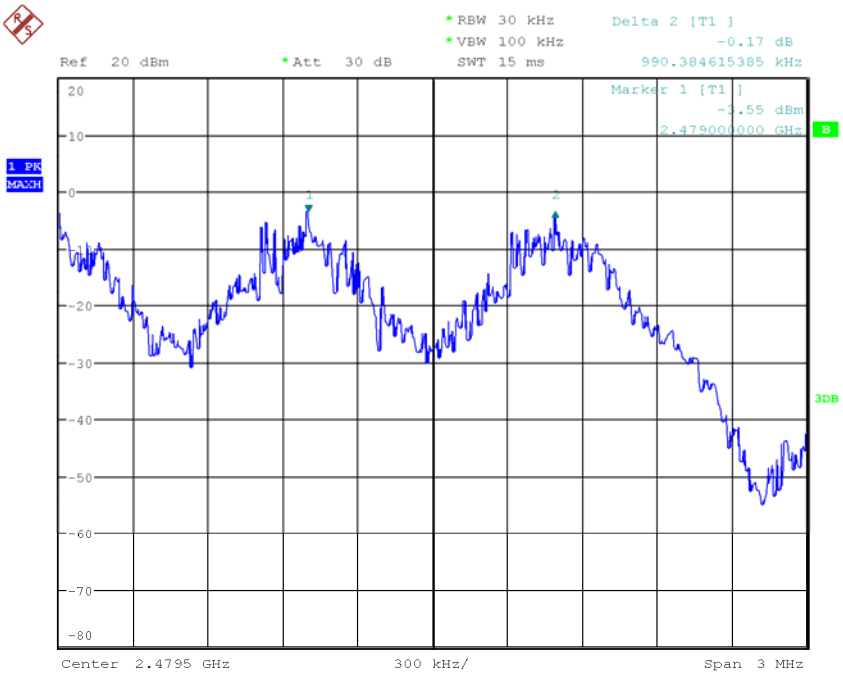


## CH39




Date: 10.JAN.2014 13:54:58

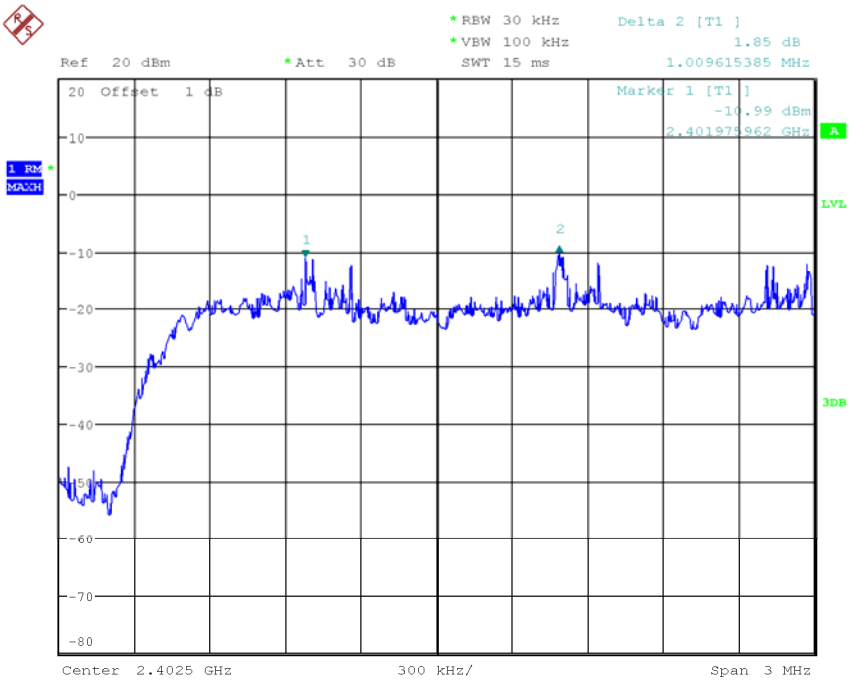
## CH78



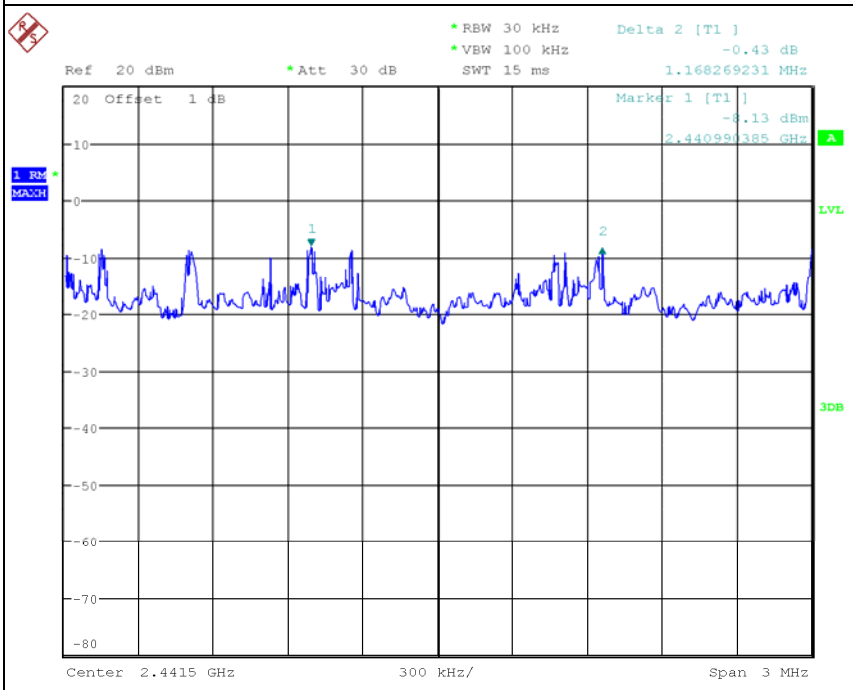

Date: 10.JAN.2014 13:56:14

| Test Mode: Hopping on_3Mbps | | | |
|---|---|---|---|
| **Frequency (MHz)** | **Ch. Separation (MHz)** | **2/3 of the 20 dB bandwidth (MHz)** | **Result** |
| 2402 | 1.010 | 0.801 | **Complies** |
| 2441 | 1.168 | 0.791 | **Complies** |
| 2480 | 0.990 | 0.801 | **Complies** |

**CH00**

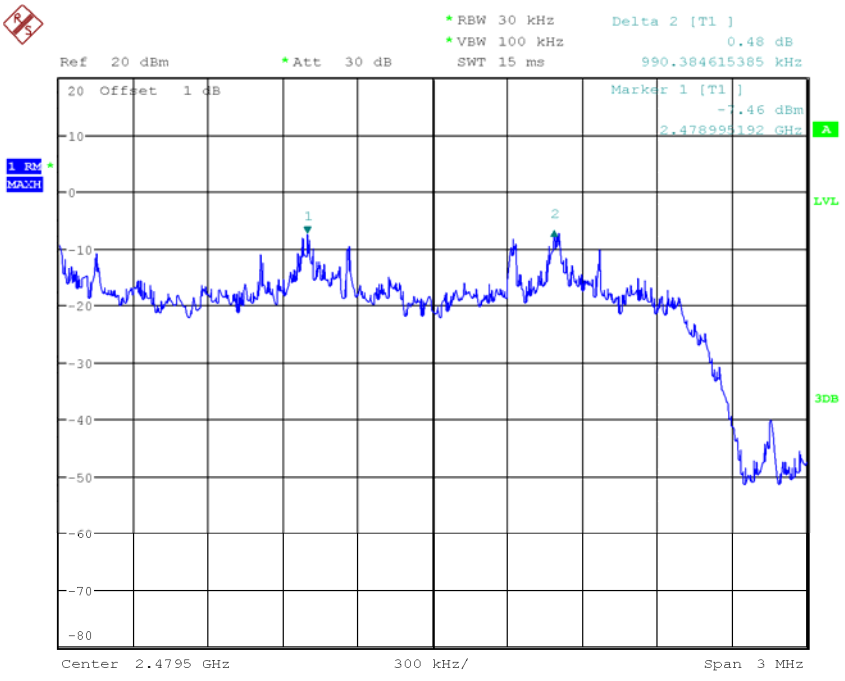


## CH39




Date: 10.JAN.2014 15:14:53

## CH78




Date: 10.JAN.2014 15:26:59

# 8. BANDWIDTH TEST

## 8.1 APPLIED PROCEDURES

| FCC Part15 (15.247) , Subpart C/ RSS-GEN and RSS-210 | | |
|---|---|---|
| Section | Test Item | Frequency Range (MHz) |
| 15.247(a)(2)<br>RSS-GEN section 4.6.1<br>RSS-210, Issue 8, Annex 8, A8.1(b) | Bandwidth | 2400-2483.5 |

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > Measurement Bandwidth or Channel Separation |
| RBW | 30 KHz (20dB Bandwidth) / 30 KHz (Channel Separation) |
| VBW | 100 KHz (20dB Bandwidth) / 100 KHz (Channel Separation) |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

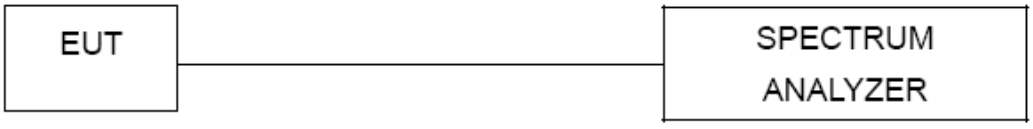
### 8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW= 30KHz, VBW=100KHz, Sweep Time = Auto.

### 8.1.2 DEVIATION FROM STANDARD

No deviation.

### 8.1.3 TEST SETUP




### 8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

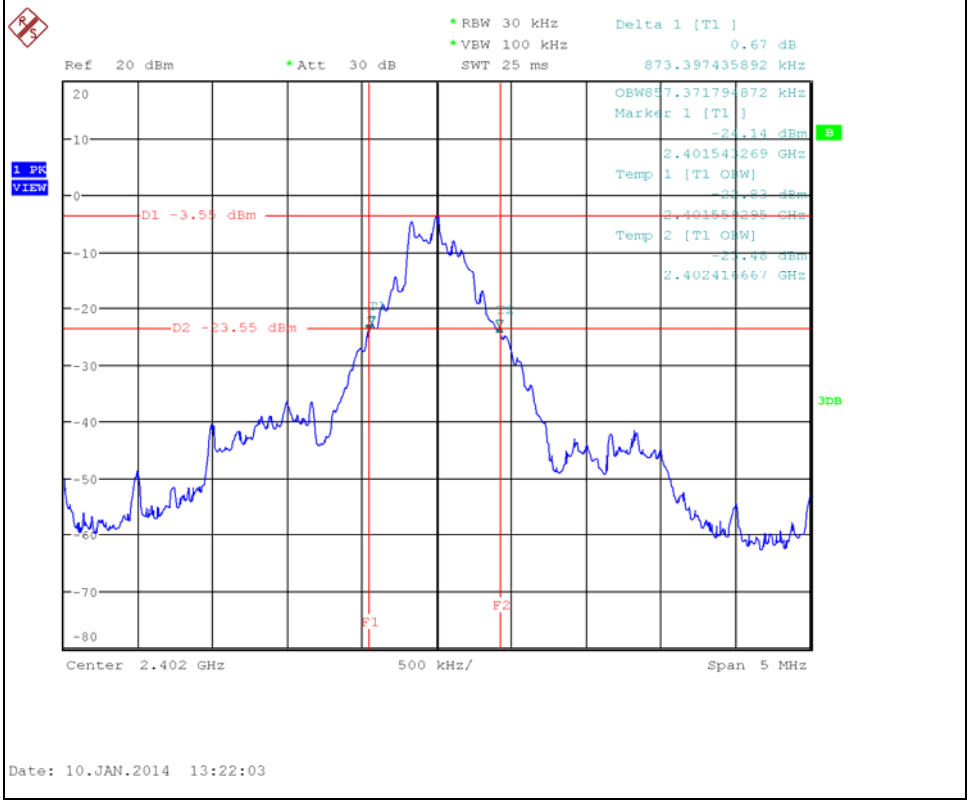
### 8.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: 120V/60Hz

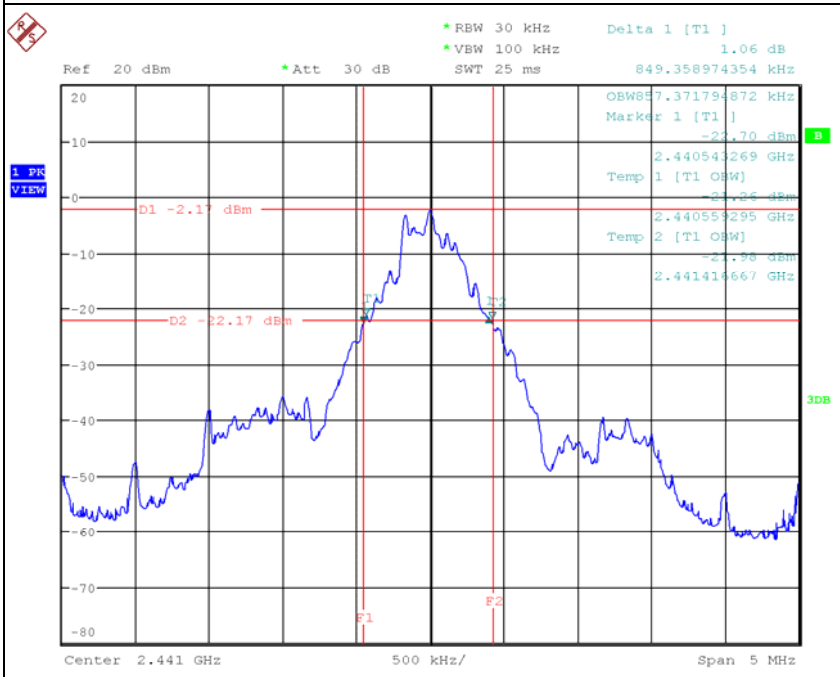
### 8.1.6 TEST RESULTS

| Test Mode: 1Mbps | | | |
|---|---|---|---|
| **Test Channel** | **Frequency (MHz)** | **20dB Bandwidth (MHz)** | **Result** |
| CH00 | 2402 | 0.873 | **PASS** |
| CH39 | 2441 | 0.849 | **PASS** |
| CH78 | 2480 | 0.857 | **PASS** |

**CH00**

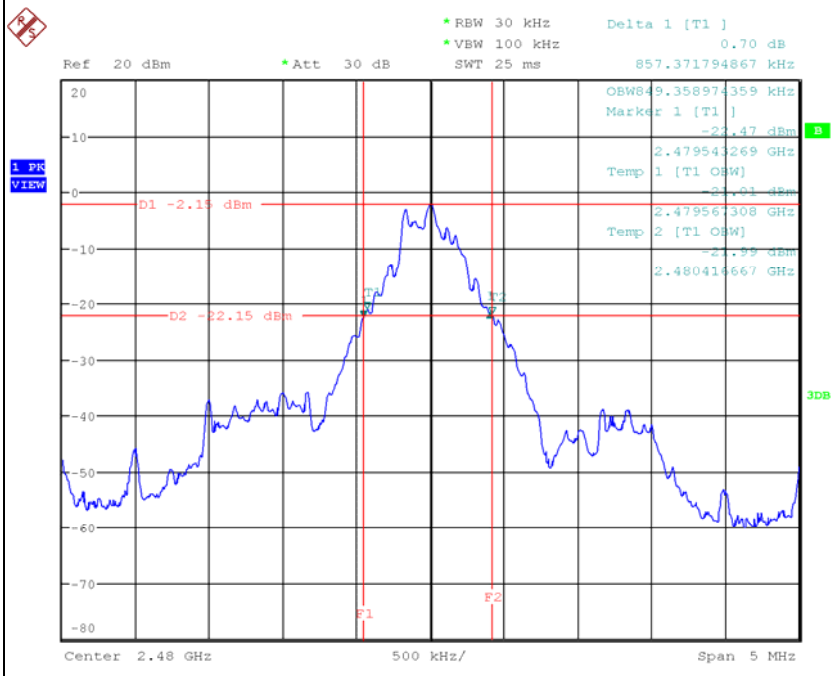


**CH39**




Date: 10.JAN.2014 13:19:06

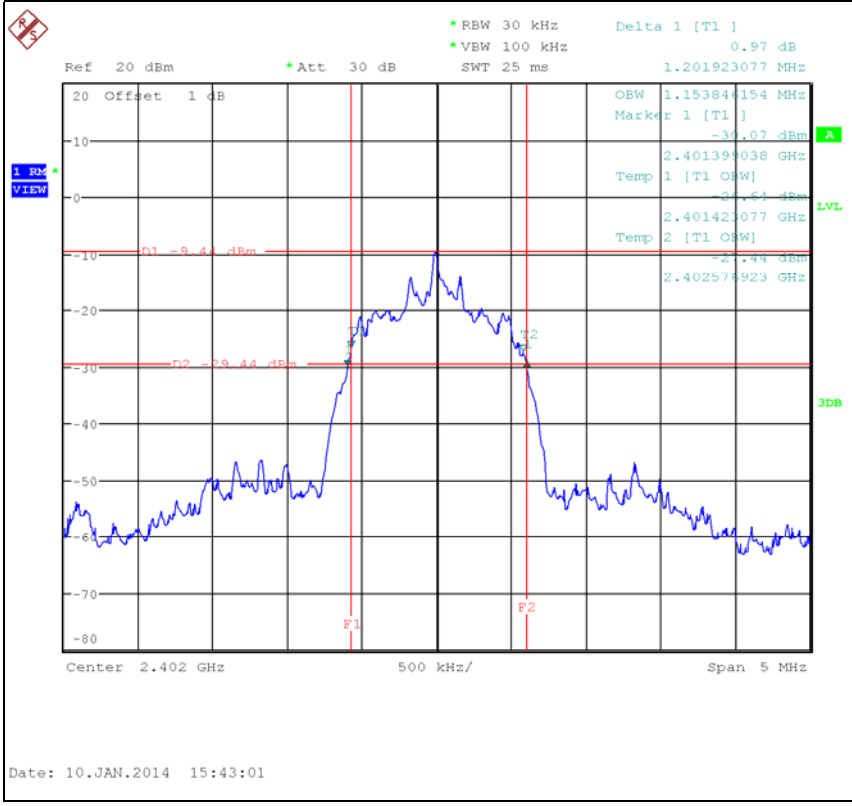
**CH78**



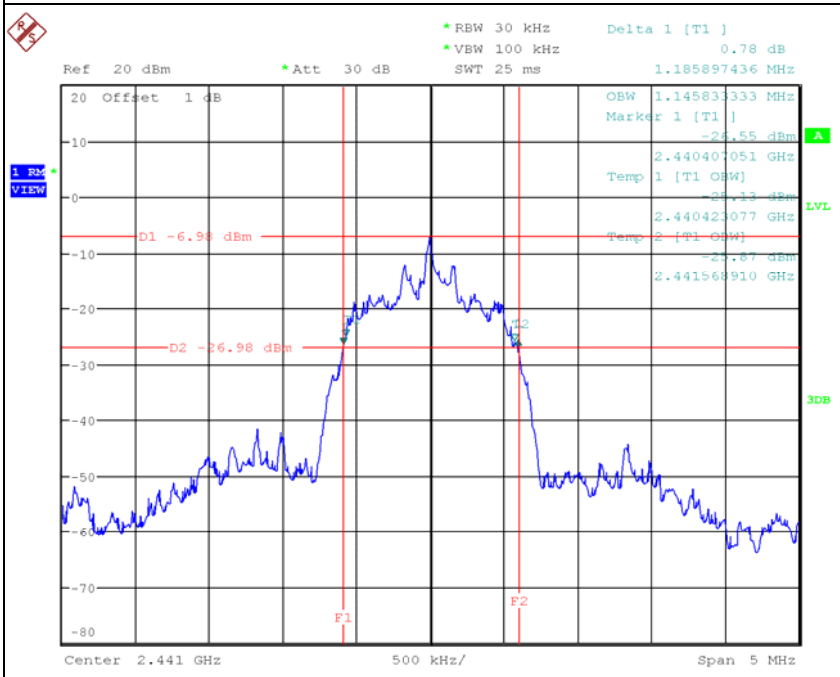

Date: 10.JAN.2014 13:16:31

| Test Mode: 3Mbps | | | |
|---|---|---|---|
| **Test Channel** | **Frequency (MHz)** | **20dB Bandwidth (MHz)** | **Result** |
| CH00 | 2402 | 1.202 | **PASS** |
| CH39 | 2441 | 1.186 | **PASS** |
| CH78 | 2480 | 1.202 | **PASS** |

**CH00**

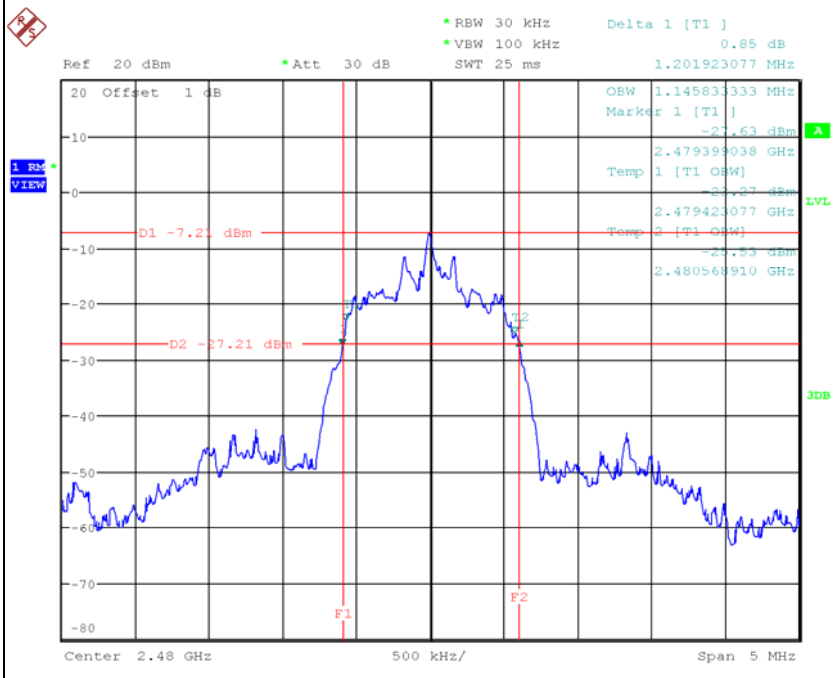


**CH39**




Date: 10.JAN.2014 15:39:51

**CH78**




Date: 10.JAN.2014 15:36:26

## 9. PEAK OUTPUT POWER TEST

### 9.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C/ RSS-GEN and RSS-210 | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(b)(1) RSS-GEN section 4.8 RSS-210, Issue 8, Annex 8, A8.1(b) | Peak Output Power | 0.125 Watt or 21dBm | 2400-2483.5 | PASS |

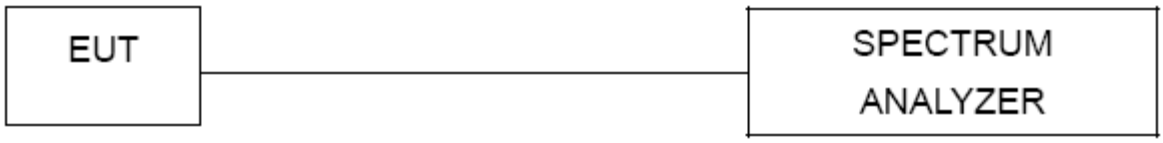
### 9.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW= 1MHz/3MHz, VBW= 1MHz/3MHz, Sweep time = Auto.

### 9.1.2 DEVIATION FROM STANDARD

No deviation.

### 9.1.3 TEST SETUP




### 9.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

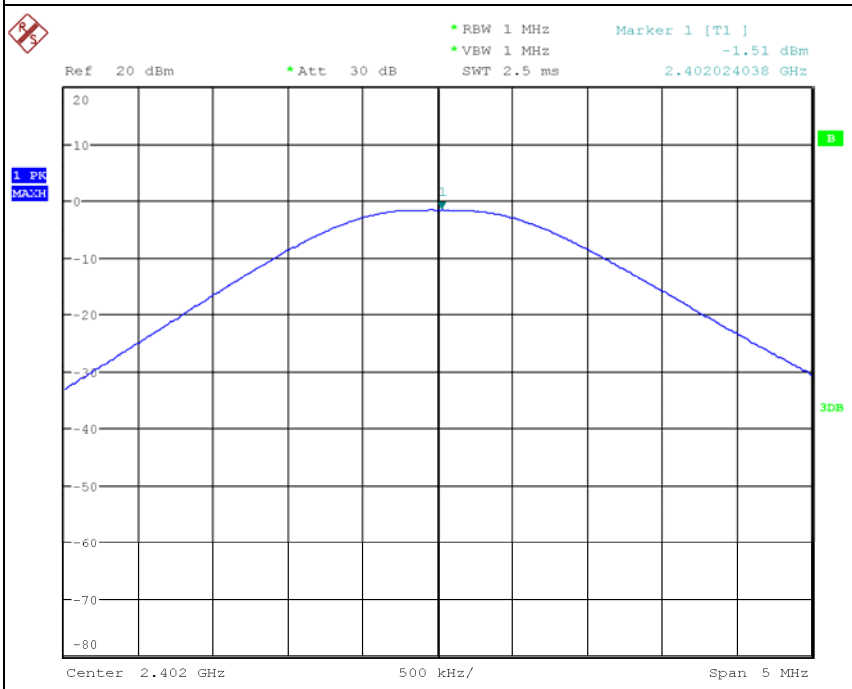
### 9.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: 120V/60Hz

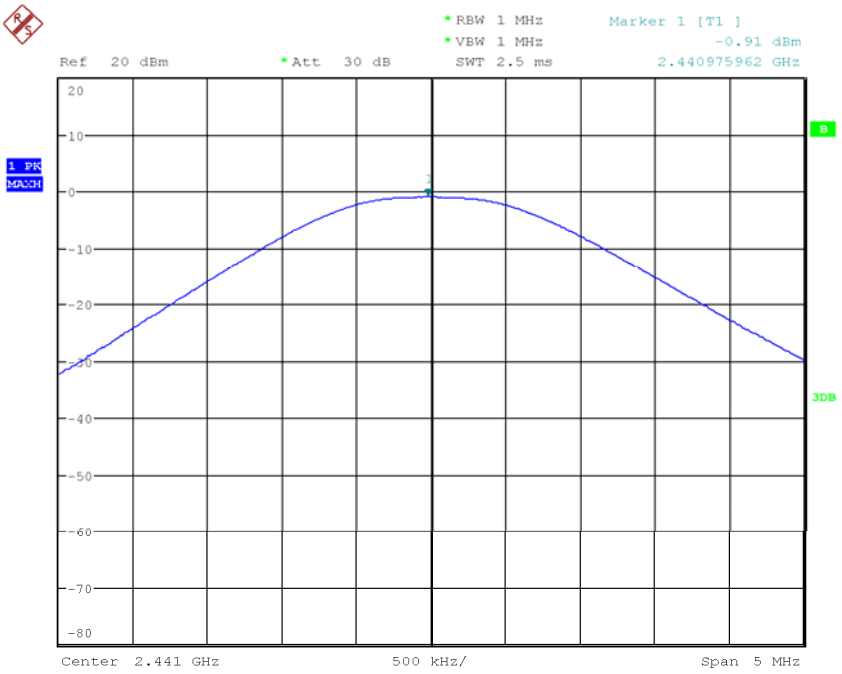
### 9.1.6 TEST RESULTS

| Test Mode: 1Mbps | | | | |
|---|---|---|---|---|
| Test Channel | Frequency (MHz) | Peak Output Power (dBm) | Limit (dBm) | Limit (Watt) |
| CH00 | 2402 | -1.51 | 21 | 0.125 |
| CH39 | 2441 | -0.91 | 21 | 0.125 |
| CH78 | 2480 | -0.96 | 21 | 0.125 |

**CH00**

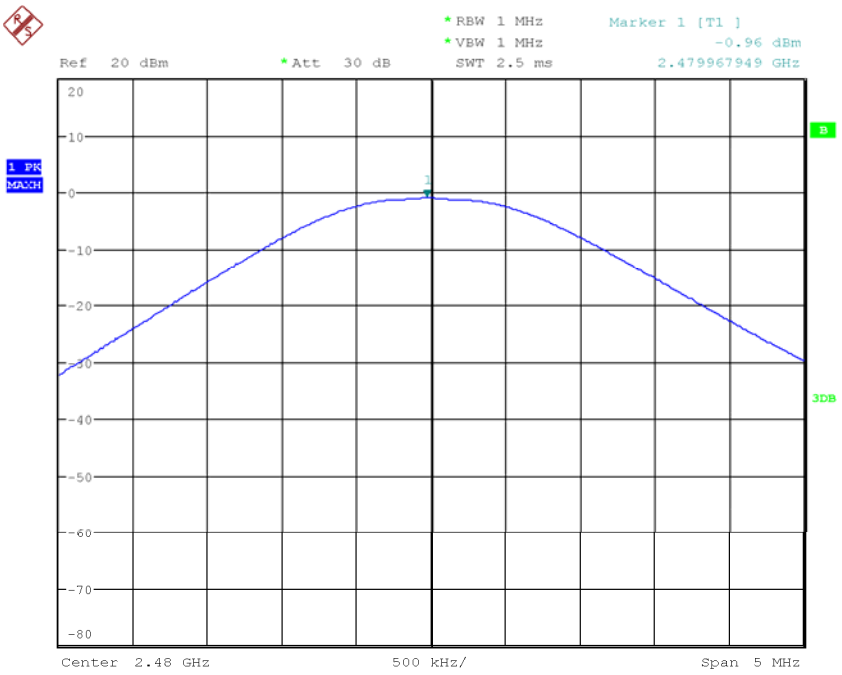


## CH39




Date: 10.JAN.2014 13:11:34

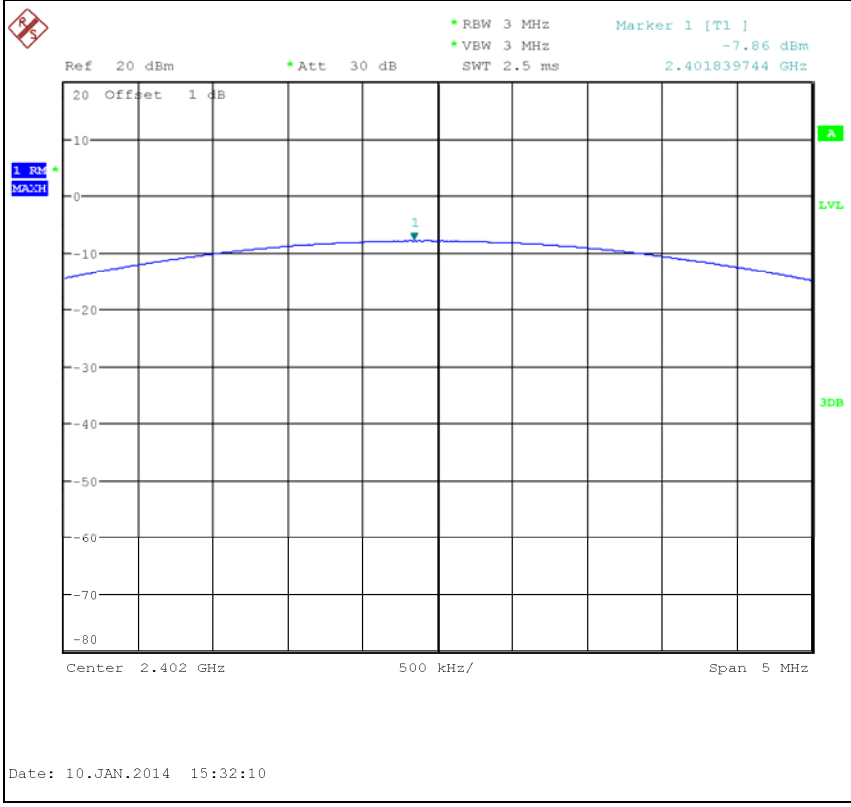
## CH78



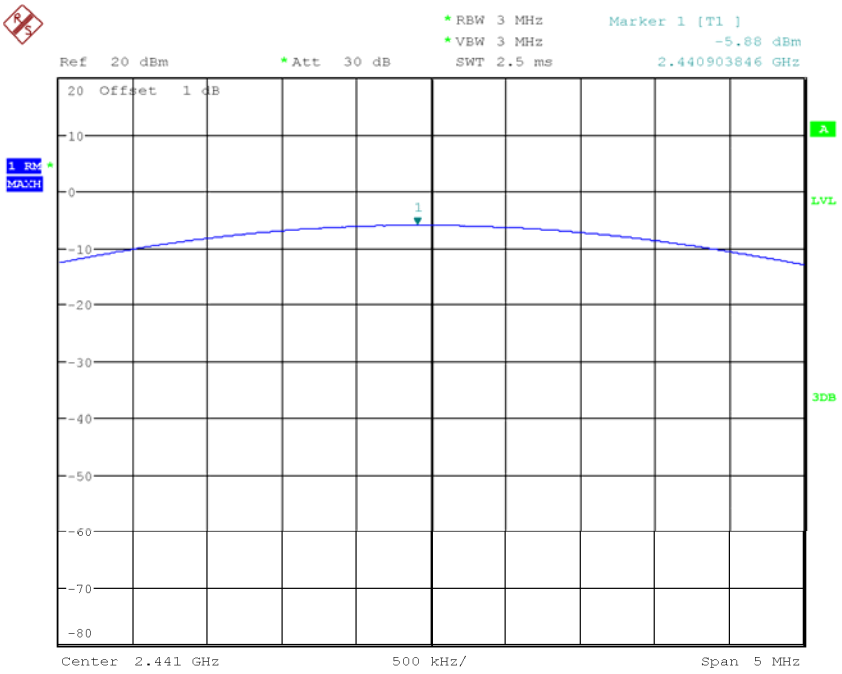

Date: 10.JAN.2014 13:12:07

| Test Mode: 3Mbps | | | | |
|---|---|---|---|---|
| Test Channel | Frequency (MHz) | Peak Output Power (dBm) | Limit (dBm) | Limit (Watt) |
| CH00 | 2402 | -7.86 | 21 | 0.125 |
| CH39 | 2441 | -5.88 | 21 | 0.125 |
| CH78 | 2480 | -5.26 | 21 | 0.125 |

**CH00**

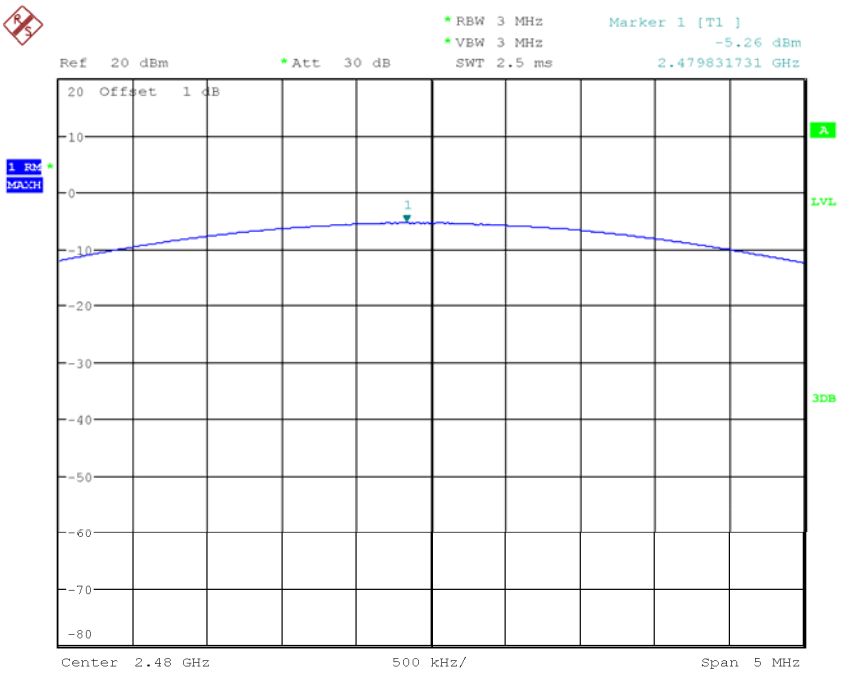


## CH39




Date: 10.JAN.2014 15:31:29

## CH78




Date: 10.JAN.2014 15:32:47

## 10. ANTENNA CONDUCTED SPURIOUS EMISSION

### 10.1 APPLIED PROCEDURES / LIMIT

20dB in any 100 KHz bandwidth outside the operating frequency band, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequency (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 |
| 960~1000 | 500 | 3 |

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| Frequency (MHz) | (dBuV/m) (at 3 meters) | |
|---|---|---|
| | Peak | Average |
| Above 1000 | 74 | 54 |

Remark: ”N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

### 10.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW= 100KHz, VBW=100KHz, Sweep time = Auto.

### 10.1.2 DEVIATION FROM STANDARD

No deviation.

### 10.1.3 TEST SETUP


### 10.1.4 EUT OPERATION CONDITIONS

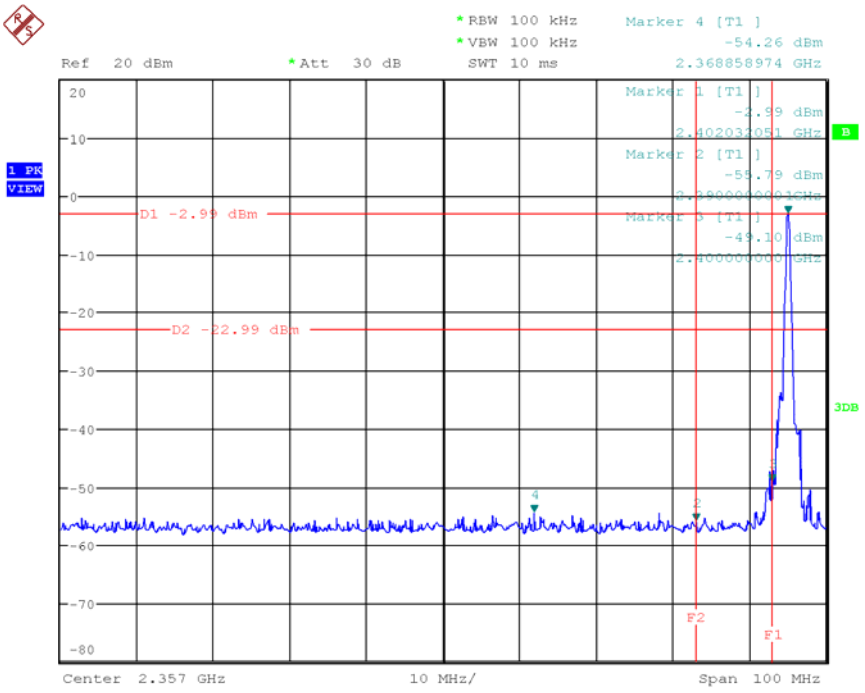
The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

### 10.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: 120V/60Hz

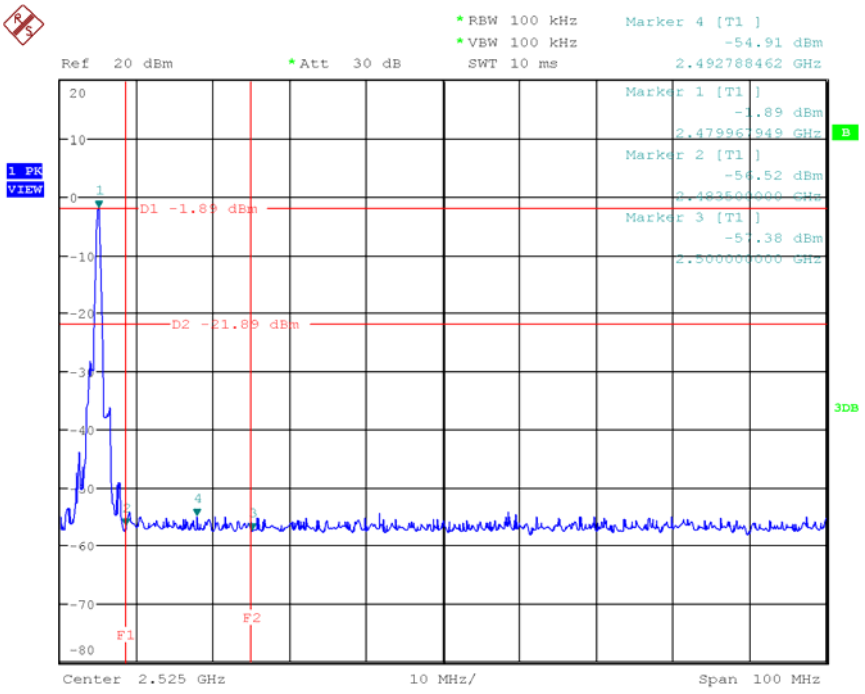
### 10.1.6 TEST RESULTS

**CH00 (Lower)_1Mbps**



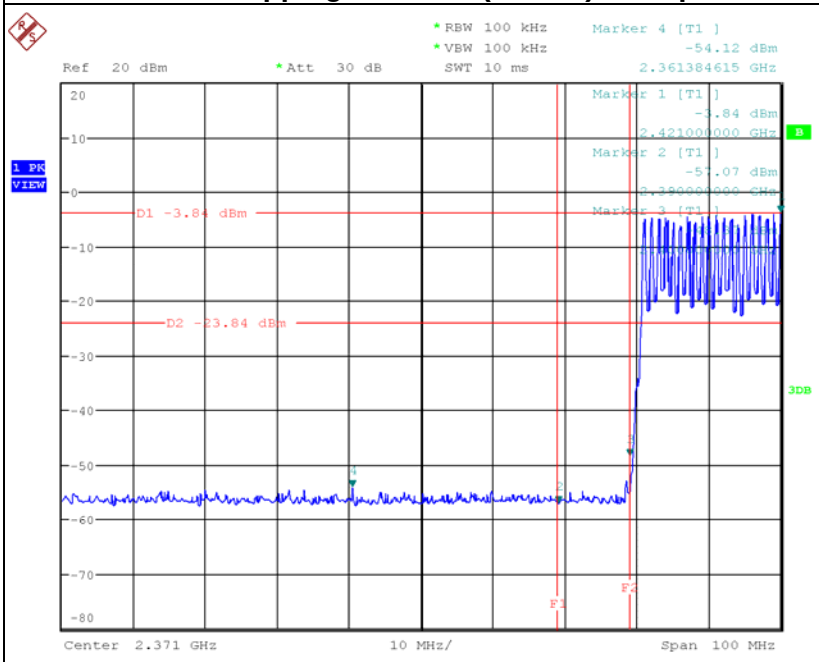

Date: 10.JAN.2014 13:30:27

**CH 78 (Upper) _1Mbps**



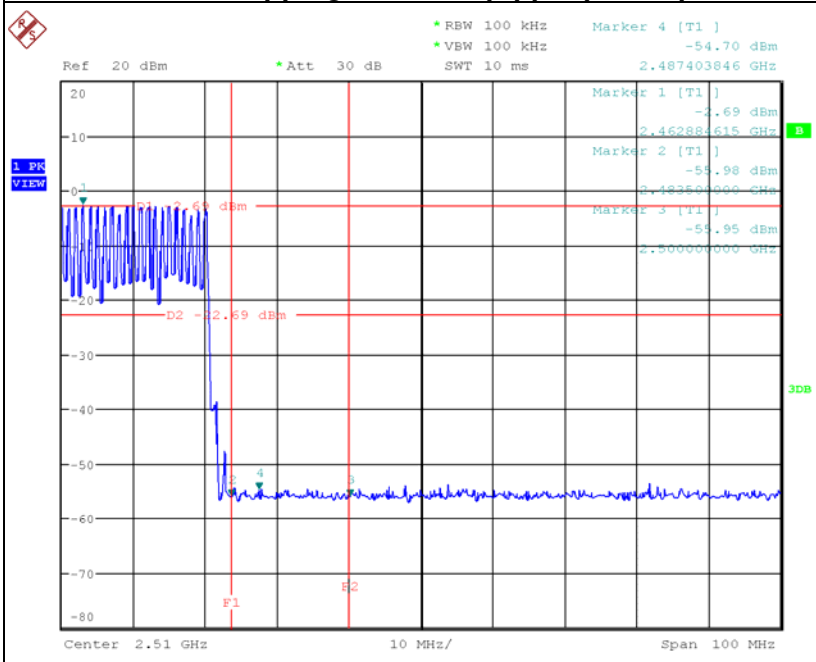

Date: 10.JAN.2014 13:42:32

**Hopping on mode (Lower ) _1Mbps**



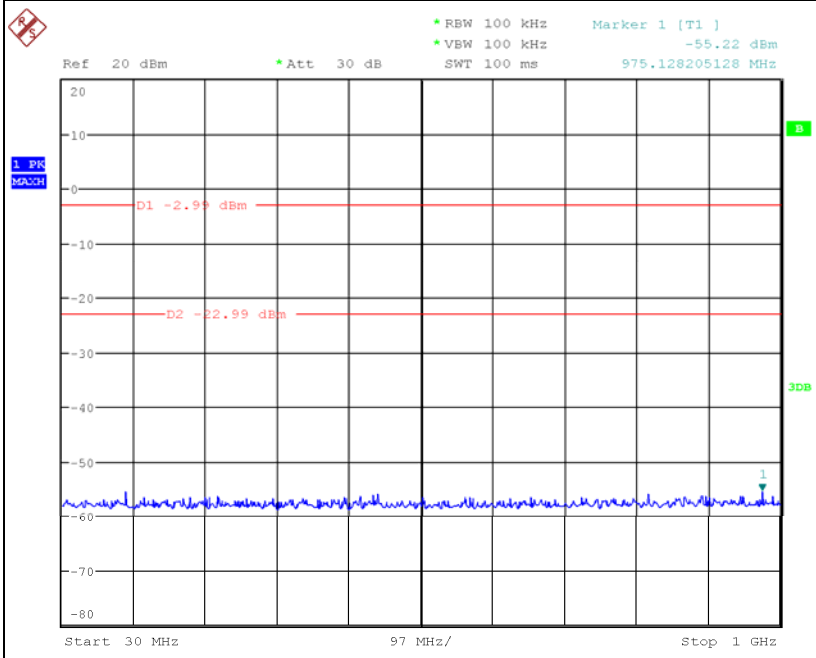

Date: 10.JAN.2014 14:05:11

**Hopping on mode (Upper ) _1Mbps**



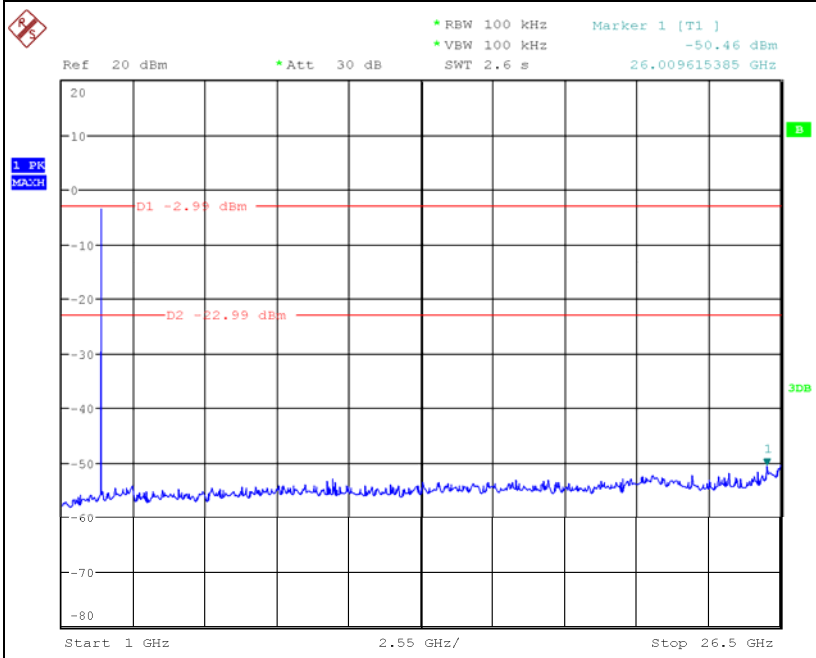

Date: 10.JAN.2014 14:12:41

## CH00 (30MHz~1GHz) _1Mbps



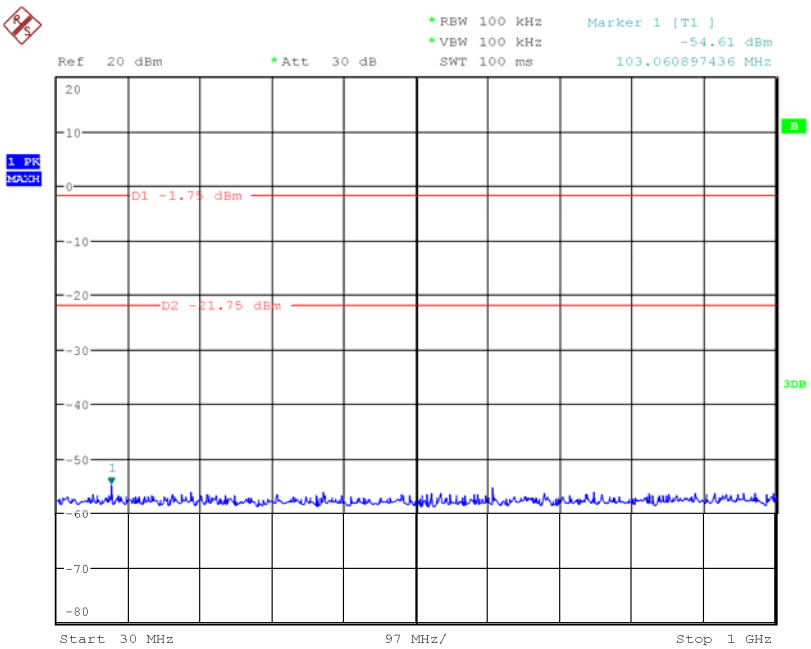

Date: 10.JAN.2014 13:32:21

## CH00 (1GHz～10th Harmonic) _1Mbps



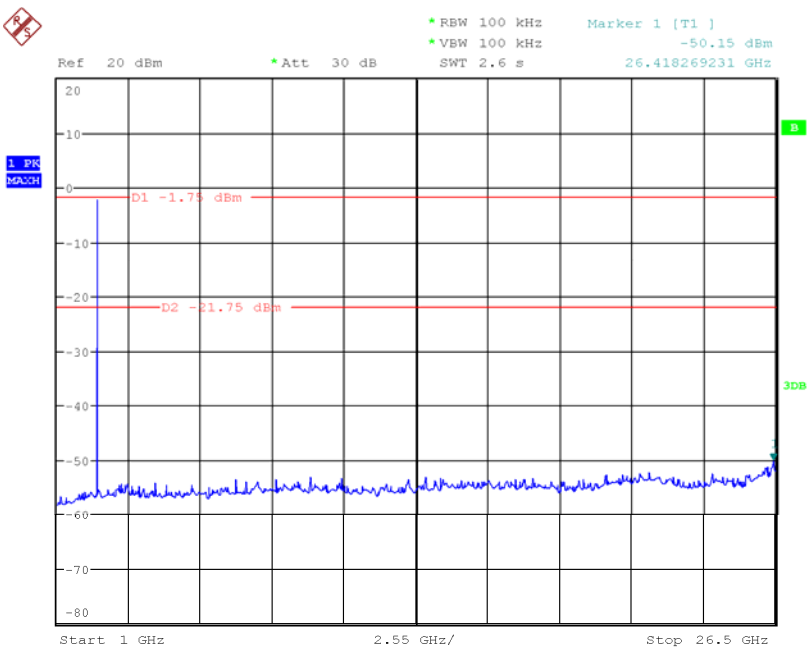

Date: 10.JAN.2014 13:33:20

## CH39 (30MHz~1GHz) _1Mbps



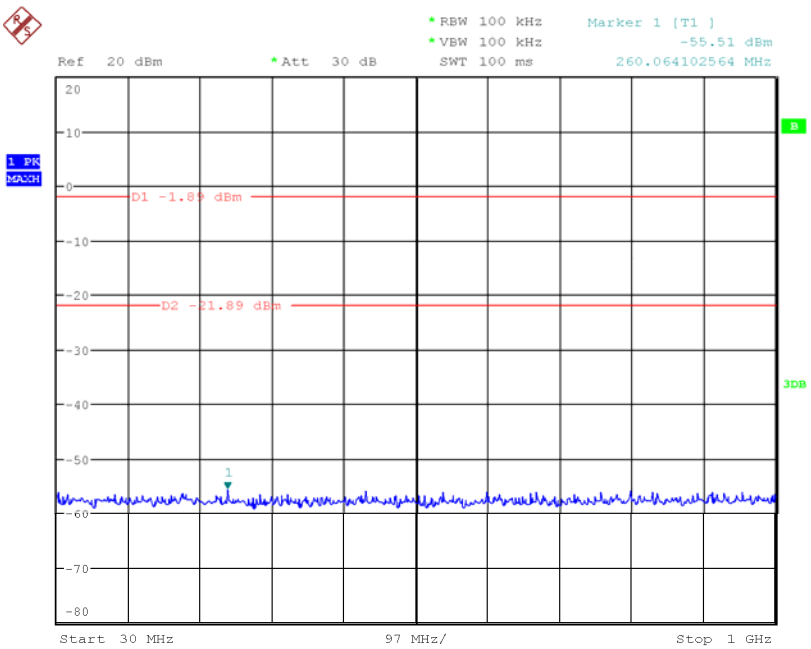

Date: 10.JAN.2014 13:37:40

## CH39 (1GHz～10th Harmonic) _1Mbps



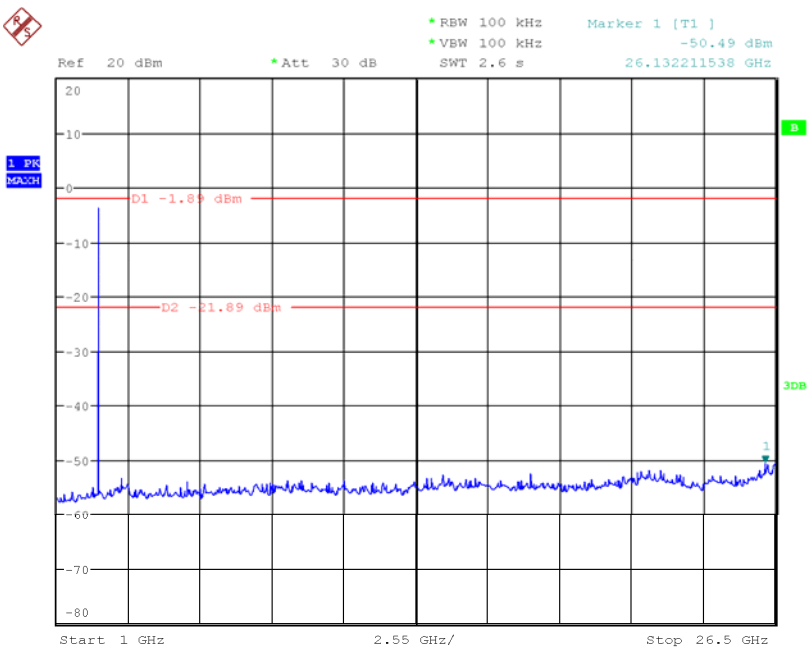

Date: 10.JAN.2014 13:38:37

## CH78 (30MHz~1GHz) _1Mbps



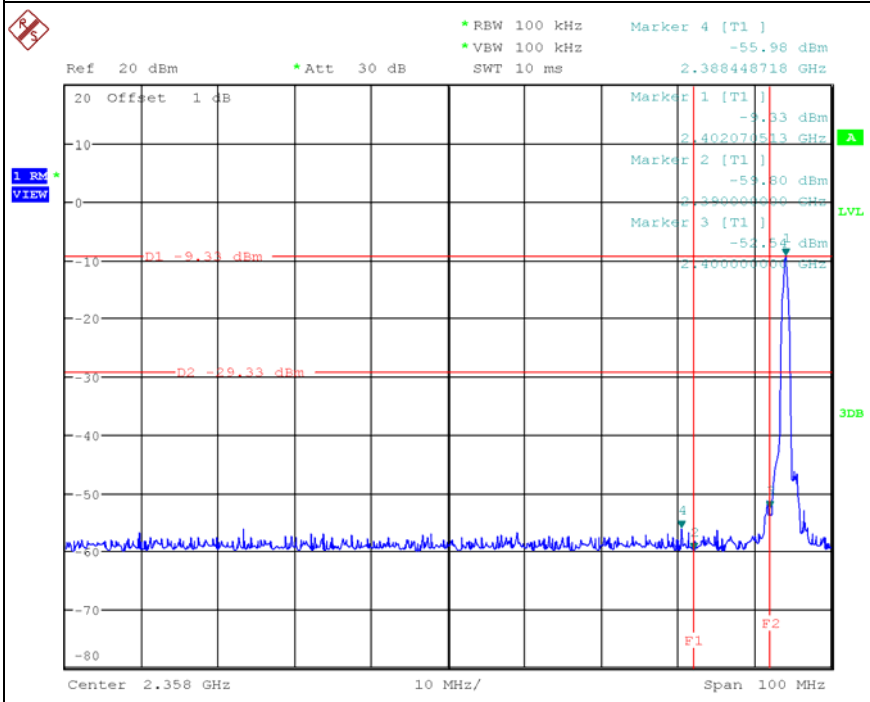

Date: 10.JAN.2014 13:43:40

## CH78 (1GHz～10th Harmonic) _1Mbps



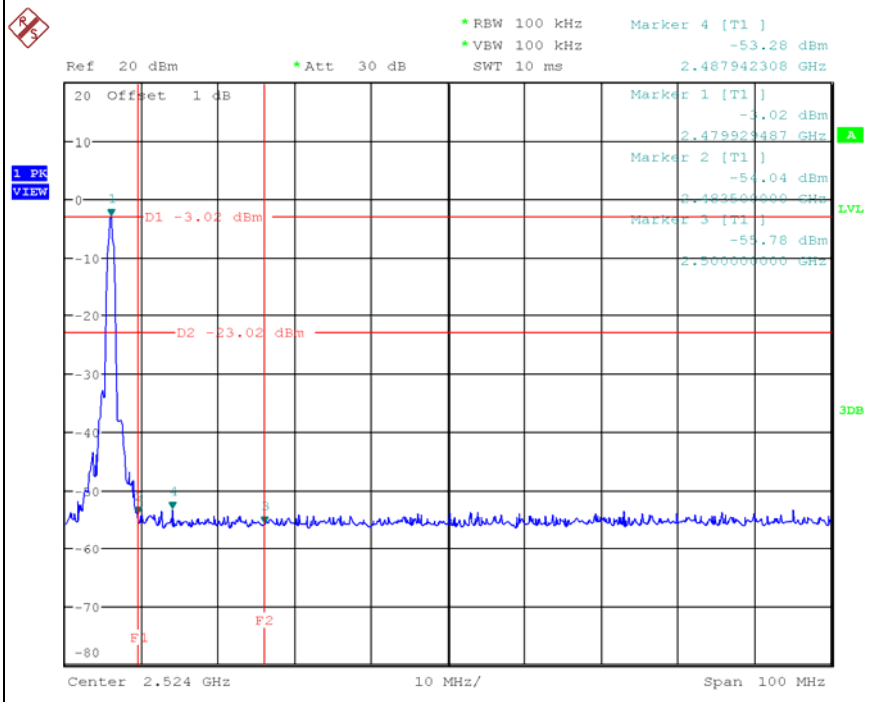

Date: 10.JAN.2014 13:44:48

**CH00 (Lower) _3Mbps**



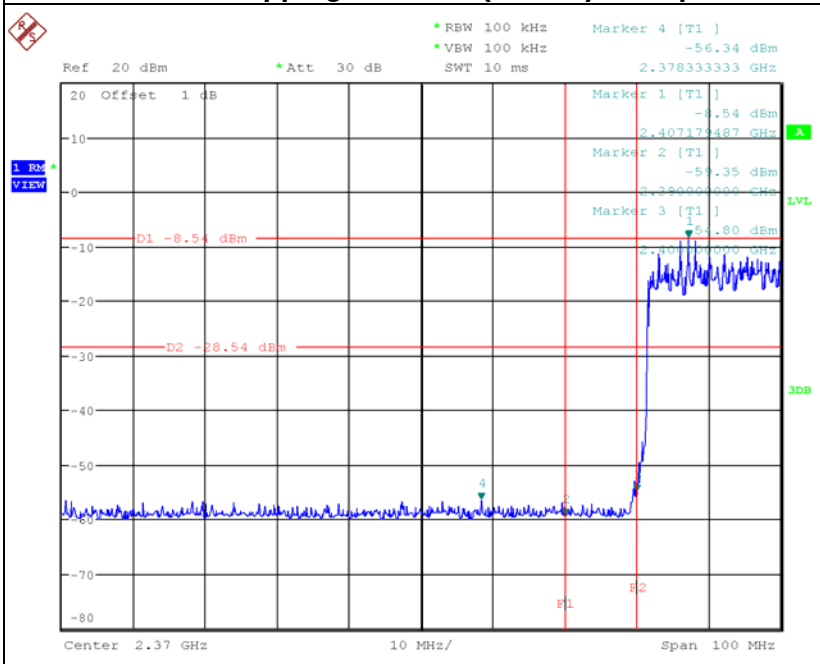

Date: 10.JAN.2014 15:47:01

**CH 78 (Upper) _3Mbps**



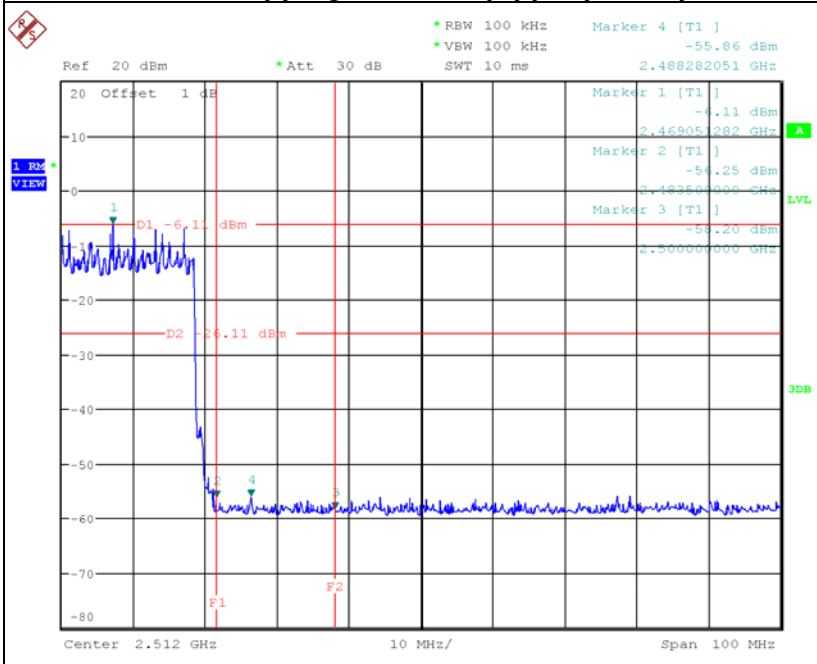

Date: 10.JAN.2014 16:00:19

**Hopping on mode (Lower ) _3Mbps**



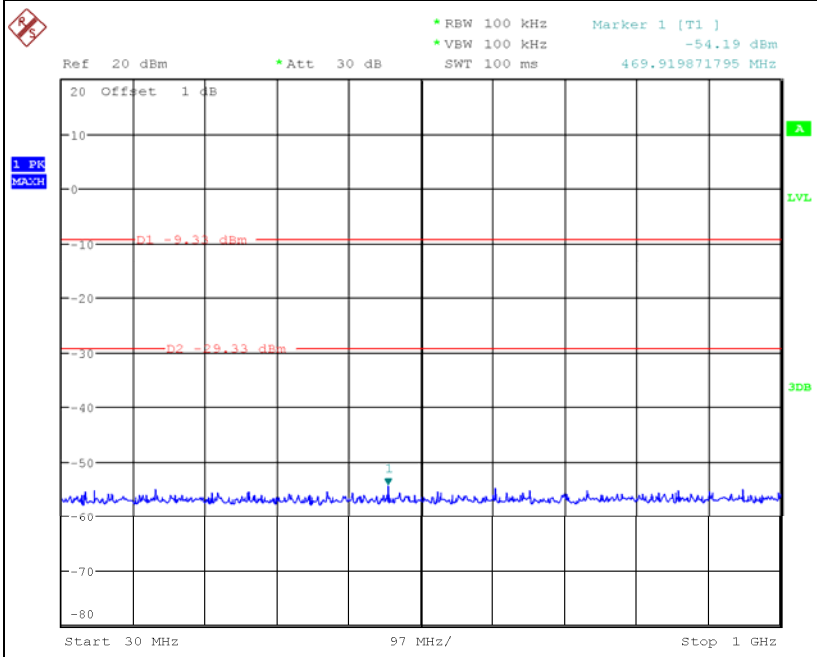

Date: 10.JAN.2014 15:06:52

**Hopping on mode (Upper ) _3Mbps**

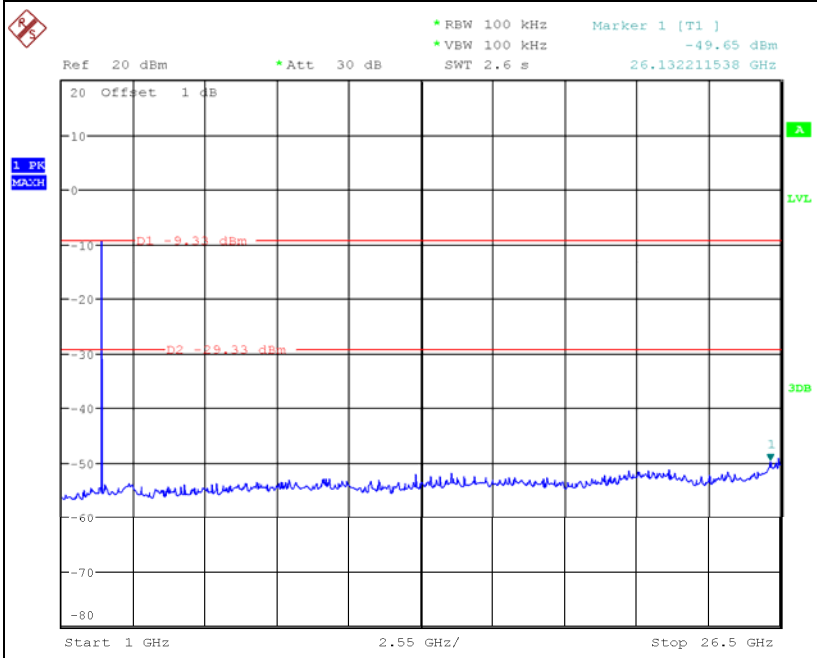



Date: 10.JAN.2014 15:09:58

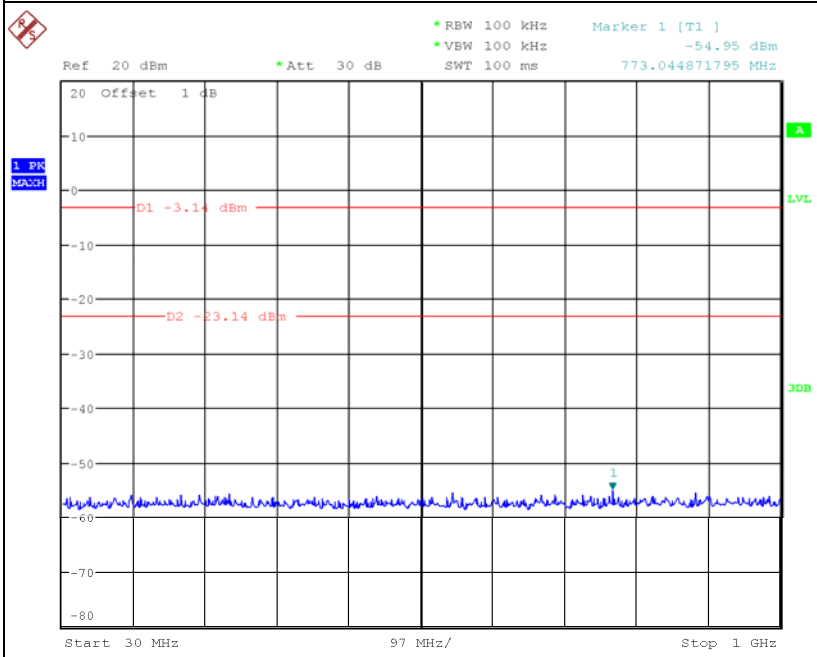
## CH00 (30MHz~1GHz) _3Mbps




## CH00 (1GHz～10th Harmonic) _3Mbps

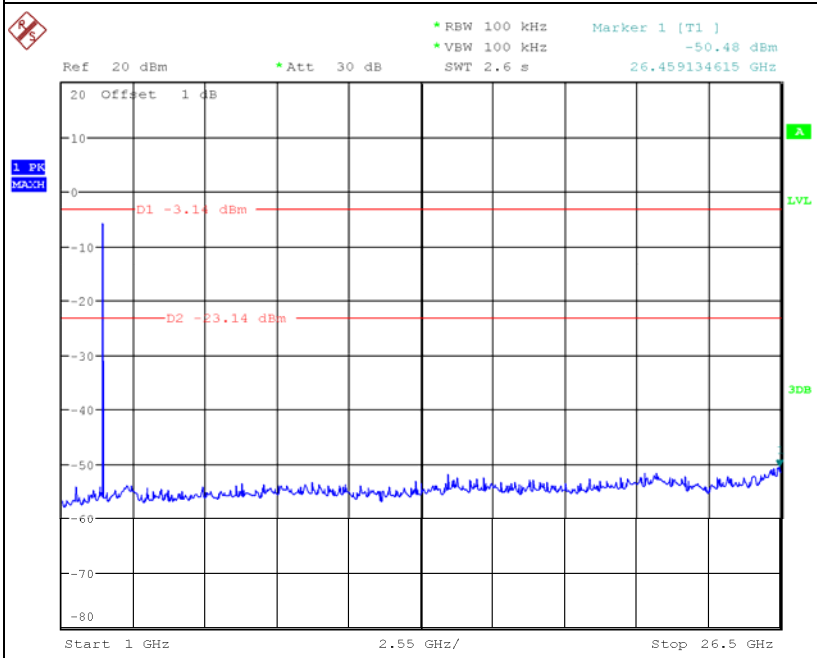


## CH39 (30MHz~1GHz) _3Mbps



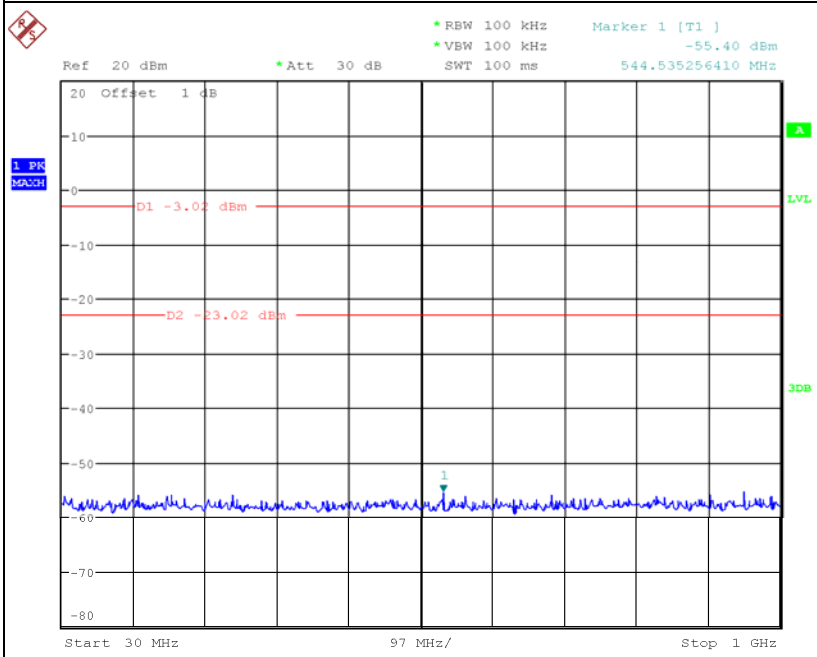

Date: 10.JAN.2014 16:04:09

## CH39 (1GHz～10th Harmonic) _3Mbps



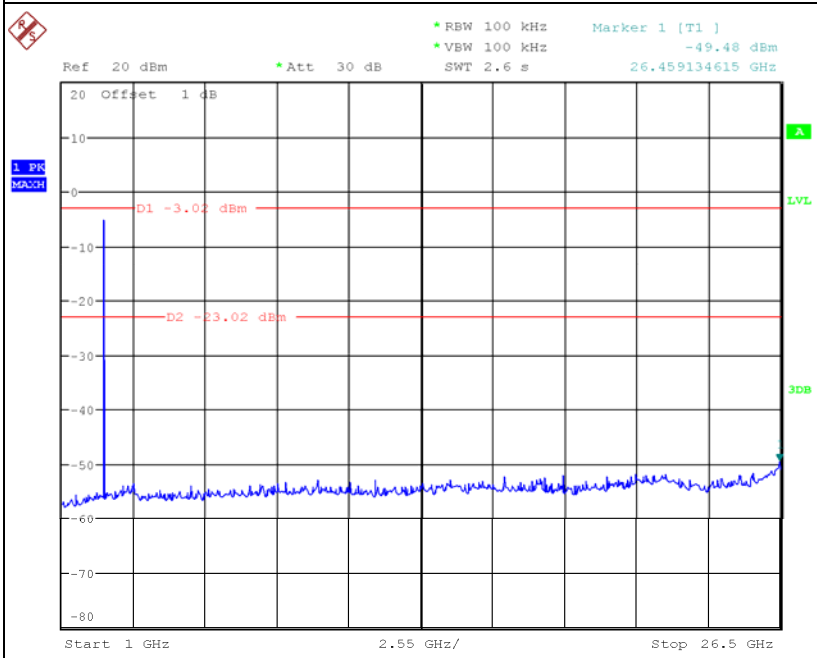

Date: 10.JAN.2014 16:04:39

## CH78 (30MHz~1GHz) _3Mbps




Date: 10.JAN.2014 16:00:49

## CH78 (1GHz～10th Harmonic) _3Mbps




Date: 10.JAN.2014 16:01:15

**11.** MEASUREMENT INSTRUMENTS LIST AND SETTING

| Conducted Emission Measurement | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | LISN | EMCO | 3816/2 | 00052765 | Apr. 25, 2014 |
| 2 | LISN | R&S | ENV216 | 100087 | Nov.09, 2014 |
| 3 | Test Cable | N/A | C_17 | N/A | Mar.15, 2014 |
| 4 | EMI TEST RECEIVER | R&S | ESCS30 | 826547/022 | Apr. 25, 2014 |
| 5 | 50Ω Terminator | SHX | TF2-3G-A | 08122902 | Apr. 25, 2014 |

| Radiated Emission Measurement | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Antenna | Schwarbeck | VULB9160 | 9160-3232 | Apr. 25, 2014 |
| 2 | Amplifier | HP | 8447D | 2944A09673 | Apr. 25, 2014 |
| 3 | Test Receiver | R&S | ESCI | 100382 | Apr. 25, 2014 |
| 4 | Test Cable | N/A | C-01_CB03 | N/A | Jul. 02, 2014 |
| 5 | Antenna | ETS | 3115 | 00075789 | Apr. 25, 2014 |
| 6 | Amplifier | Agilent | 8449B | 3008A02274 | Apr. 25, 2014 |
| 7 | Spectrum | Agilent | E4408B | US39240143 | Nov. 09, 2014 |
| 8 | Test Cable | HUBER+SUHNER | C-45 | N/A | Apr. 30, 2014 |
| 9 | Controller | CT | SC100 | N/A | N/A |
| 10 | Horn Antenna | EMCO | 3115 | 9605-4803 | Apr. 25, 2014 |
| 11 | Active Loop Antenna | R&S | HFH2-Z2 | 830749/020 | Apr. 25, 2014 |
| 12 | Broad-Band Horn Antenna | Schwarzbeck | BBHA 9170 | 9170319 | Oct. 22, 2014 |

| Number of Hopping Channel | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100185 | Nov. 09, 2014 |

| Average Time of Occupancy | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100185 | Nov. 09, 2014 |

| Hopping Channel Separation Measurement | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100185 | Nov. 09, 2014 |

| Bandwidth | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100185 | Nov. 09, 2014 |

| Peak Output Power | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100185 | Nov. 09, 2014 |

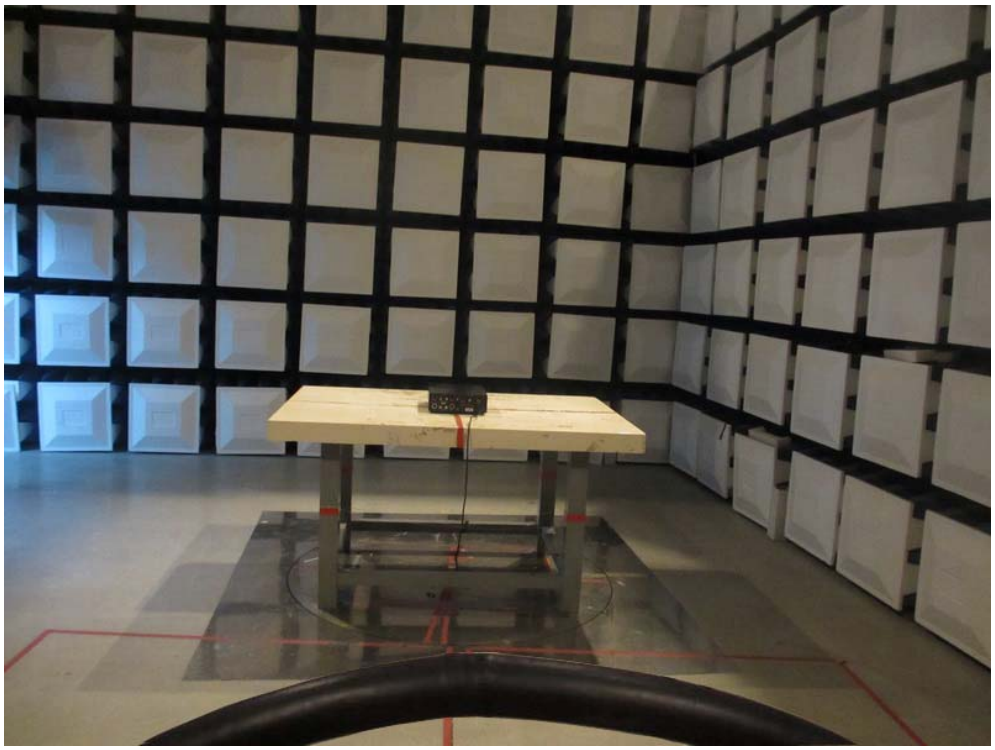
| Antenna Conducted Spurious Emission | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100185 | Nov. 09, 2014 |

Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

## 12. EUT TEST PHOTO

### Conducted Measurement Photos

**Radiated Measurement Photos**
**9K~30MHz**



**Radiated Measurement Photos**
**30~1000MHz**

**Radiated Measurement Photos**
**Above 1000MHz**