

# FCC Radio Test Report

## FCC ID:BEJV320KB

This report concerns (check one): ☒ Original Grant ☐ Class II Change

**Project No.** : 1502150  
**Equipment** : Wireless Keyboard  
**Model Name** : V320KB  
**Applicant** : LG Electronics USA  
**Address** : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey  
07632 ,United States.

**Date of Receipt** : Feb. 25, 2015  
**Date of Test** : Feb. 25, 2015 ~ Mar. 10, 2015  
**Issued Date** : Mar. 11, 2015  
**Tested by** : BTL Inc.

**Testing Engineer** : Rush Kao  
(Rush Kao)

**Technical Manager** : Jeff Yang  
(Jeff Yang)

**Authorized Signatory** : Andy Chiu  
(Andy Chiu)

# **B T L I N C .**

B1, No.37, Lane 365, Yang Guang St.,  
Nei-Hu District, Taipei City 114, Taiwan.  
TEL:+886-2-2657-3299 FAX: +886-2- 2657-3331

### **Declaration**

**BTL** 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 **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

**BTL's** reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

**BTL's** reports must not be used by the client to claim product endorsement by the authorities or any agency of the Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and **BTL-self**, extracts from the test report shall not be reproduced except in full with **BTL's** authorized written approval.

**BTL's** laboratory quality assurance procedures are in compliance with the **ISO Guide17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

### **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.

| <b>Table of Contents</b>                              | <b>Page</b> |
|-------------------------------------------------------|-------------|
| 1 . CERTIFICATION                                     | 6           |
| 2 . SUMMARY OF TEST RESULTS                           | 7           |
| 2.1 TEST FACILITY                                     | 8           |
| 2.2 MEASUREMENT UNCERTAINTY                           | 8           |
| 3 .GENERAL INFORMATION                                | 9           |
| 3.1 GENERAL DESCRIPTION OF EUT                        | 9           |
| 3.2 DESCRIPTION OF TEST MODES                         | 11          |
| 3.3 BLOCKDIAGRAMSHOWINGTHECONFIGURATIONOFSYSTEMTESTED | 12          |
| 3.4 DESCRIPTION OF SUPPORT UNITS                      | 12          |
| 4 .EMC EMISSION TEST                                  | 13          |
| 4.1 CONDUCTED EMISSION MEASUREMENT                    | 13          |
| 4.1.1 POWER LINE CONDUCTED EMISSION                   | 13          |
| 4.1.2 TESTPROCEDURE                                   | 13          |
| 4.1.3 DEVIATIONFROMTESTSTANDARD                       | 13          |
| 4.1.4 TESTSETUP                                       | 14          |
| 4.1.5 EUT OPERATING CONDITIONS                        | 14          |
| 4.1.6 EUT TEST CONDITIONS                             | 14          |
| 4.1.7 TEST RESULTS                                    | 14          |
| 4.2 RADIATED EMISSION MEASUREMENT                     | 15          |
| 4.2.1 RADIATED EMISSION LIMITS                        | 15          |
| 4.2.2 TESTPROCEDURE                                   | 18          |
| 4.2.3 DEVIATIONFROMTESTSTANDARD                       | 18          |
| 4.2.4 TESTSETUP                                       | 19          |
| 4.2.5 EUT OPERATING CONDITIONS                        | 20          |
| 4.2.6 EUT TEST CONDITIONS                             | 20          |
| 4.2.7 TEST RESULTS (9KHZ TO 30MHZ)                    | 20          |
| 4.2.8 TEST RESULTS (BETWEEN 30 – 1000 MHz)            | 20          |
| 4.2.9 TEST RESULTS (ABOVE1000 MHz)                    | 21          |
| 5 .BANDWIDTH TEST                                     | 22          |
| 5.1 TEST PROCEDURE                                    | 22          |
| 5.2 DEVIATION FROM STANDARD                           | 22          |
| 5.3 TEST SETUP                                        | 22          |
| 5.4 EUT OPERATION CONDITIONS                          | 22          |
| 5.5 EUT TEST CONDITIONS                               | 22          |
| 5.6 TEST RESULTS                                      | 22          |
| 6 .ANTENNA CONDUCTED SPURIOUS EMISSION                | 23          |
| 6.1 APPLIED PROCEDURES / LIMIT                        | 23          |

| <b>Table of Contents</b>                           | <b>Page</b> |
|----------------------------------------------------|-------------|
| 6.2 TEST PROCEDURE                                 | 23          |
| 6.3 DEVIATION FROM STANDARD                        | 23          |
| 6.4 TEST SETUP                                     | 23          |
| 6.5 EUT OPERATION CONDITIONS                       | 24          |
| 6.6 EUT TEST CONDITIONS                            | 24          |
| 6.7 TEST RESULTS                                   | 24          |
| 7 .MEASUREMENT INSTRUMENTS LIST AND SETTING        | 25          |
| 8 .EUT TEST PHOTO                                  | 26          |
| ATTACHMENT A - CONDUCTED EMISSION                  | 29          |
| ATTACHMENT B - RADIATED EMISSION (9KHZ-30MHZ)      | 30          |
| ATTACHMENT C -RADIATED EMISSION (30MHZ TO 1000MHZ) | 32          |
| ATTACHMENT D -RADIATED EMISSION (ABOVE 1000MHZ)    | 35          |
| ATTACHMENT E - BANDWIDTH                           | 48          |
| ATTACHMENT F - ANTENNA CONDUCTED SPURIOUS EMISSION | 51          |

### REPORT ISSUED HISTORY

| Issued No.         | Description     | Issued Date   |
|--------------------|-----------------|---------------|
| BTL-FCCP-1-1502150 | Original Issue. | Mar. 11, 2015 |

## 1. CERTIFICATION

Equipment : Wireless Keyboard  
Brand Name : LG  
Model Name : V320KB  
Applicant : LG Electronics USA  
Manufacturer : LITE-ON TECHNOLOGY CORP.  
Address : 16F, 392 , Ruey Kuang Road, Neihu, Taipei 11492, Taiwan, R.O.C  
Date of Test : Feb. 25, 2015 ~ Mar. 10, 2015  
Test Sample : Engineering Sample  
Standard(s) : FCC Part15, Subpart C: 2013(15.249)/ ANSI C63.4-2009

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1502150) 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):

| FCC Part15, Subpart C: 2013 (15.249) |                            |          |        |
|--------------------------------------|----------------------------|----------|--------|
| StandardSection                      | Test Item                  | Judgment | Remark |
| 15.207                               | Conducted Emission         | N/A      |        |
| 15.209<br>15.249                     | Radiated Spurious Emission | PASS     |        |

**NOTE:**

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

## 2.1 TEST FACILITY

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

**CB08:** (FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)  
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

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

**CB08:** (VCCI RN: G-91; FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)  
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

BTL's test firm number for FCC: 319330

## 2.2 MEASUREMENT UNCERTAINTY

**The measurement uncertainty is not specified by FCC rules and for reference only.**

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

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

A.

B. Radiated emission test:

| Test Site | Item                    | Measurement Frequency Range | Uncertainty   | NOTE    |
|-----------|-------------------------|-----------------------------|---------------|---------|
| CB08      | Radiated emission at 3m | Horizontal Polarization     | 30 - 200MHz   | 3.35 dB |
|           |                         |                             | 200 - 1000MHz | 3.11 dB |
|           |                         |                             | 1 - 18GHz     | 3.97 dB |
|           |                         |                             | 18 - 40GHz    | 4.01 dB |
|           |                         | Vertical Polarization       | 30 - 200MHz   | 3.22 dB |
|           |                         |                             | 200 - 1000MHz | 3.24 dB |
|           |                         |                             | 1 - 18GHz     | 4.05 dB |
|           |                         |                             | 18 - 40GHz    | 4.04 dB |

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our  $U_{lab}$  values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called  $U_{CISPR}$ , as follows:

Radiated Disturbance (electric field strength on an open area test site or alternative test site) –  
30 MHz – 1000 MHz : 5.2 dB

It can be seen that our  $U_{lab}$  values are smaller than  $U_{CISPR}$ .

### 3.GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

|                     |                                                                                           |                       |
|---------------------|-------------------------------------------------------------------------------------------|-----------------------|
| Equipment           | Wireless Keyboard                                                                         |                       |
| Brand Name          | LG                                                                                        |                       |
| Model Name          | V320KB                                                                                    |                       |
| Model Difference    | The equipment has two colors of black and white,and Only differ in the appreance of color |                       |
| Product Description | Operation Frequency                                                                       | 2403~2480 MHz         |
|                     | Modulation Technology                                                                     | GFSK(2Mbps)           |
|                     | Data rate                                                                                 |                       |
|                     | Field Strength                                                                            | 91.44dBuV/m(peak Max) |
| PowerSource         | Supplier from 2*AAA battery                                                               |                       |
| Power Rating        | DC 3V 30mA                                                                                |                       |

Note:

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

Channel List:

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

2. Table for Filed Antenna

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) | Note |
|------|-------|------------|--------------|-----------|------------|------|
| 1    | N/A   | N/A        | PCB layout   | N/A       | 2.96       |      |

### 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based 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.

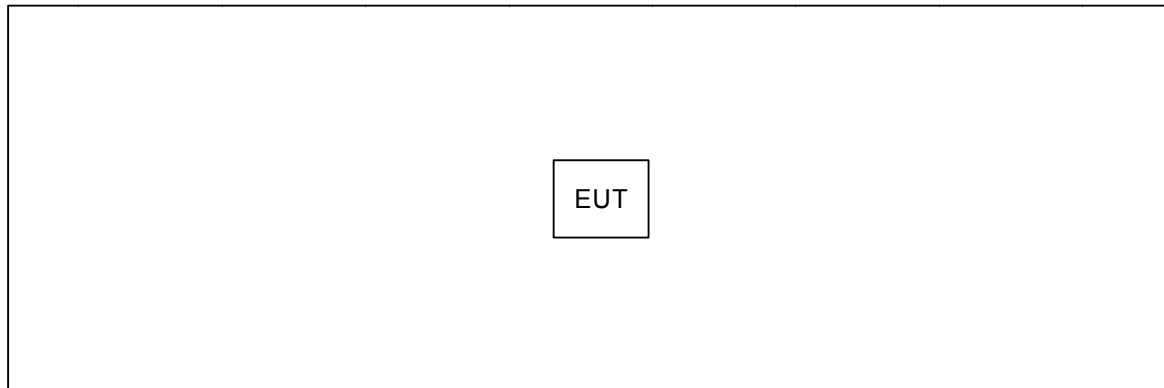
| Pretest Mode | Description       |
|--------------|-------------------|
| Mode 1       | TX Low Channel    |
| Mode 2       | TX Middle Channel |
| Mode 3       | TX High Channel   |

| For Radiated Test |                   |
|-------------------|-------------------|
| Final Test Mode   | Description       |
| Mode 1            | TX Low Channel    |
| Mode 2            | TX Middle Channel |
| Mode 3            | TX High Channel   |

Note:

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

### 3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



### 3.4 DESCRIPTION OF SUPPORT UNITS

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

| Item | Equipment | Mfr/Brand | Model/Type No. | FCC ID | 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 (FREQUENCY RANGE 150KHZ-30MHZ)

| Frequency of Emission (MHz) | Conducted Limit (dBμV) |           |
|-----------------------------|------------------------|-----------|
|                             | Quasi-peak             | Average   |
| 0.15 -0.5                   | 66 to 56*              | 56 to 46* |
| 0.50 -5.0                   | 56                     | 46        |
| 5.0 -30.0                   | 60                     | 50        |

Note:

- (1) The limit of " \* " decreases with the logarithm of the frequency
- (2) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)  
 Margin Level = Measurement Value – Limit Value

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    |

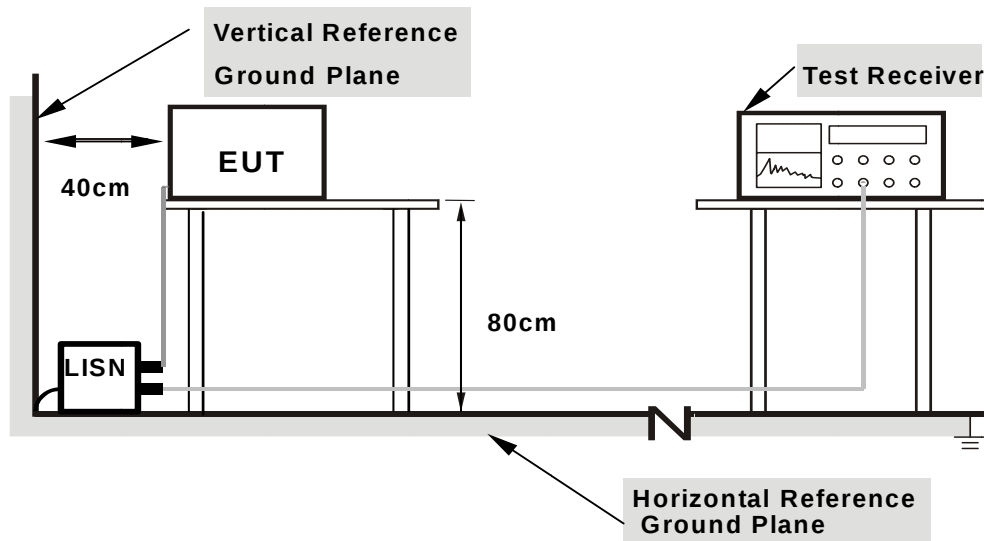
#### 4.1.2 TESTPROCEDURE

- 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 groundplane 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 TESTSETUP



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

#### 4.1.5EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it).The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

The EUT was programmed to be in continuously transmitting mode.

#### 4.1.6EUT TEST CONDITIONS

Temperature: N/A

Relative Humidity: N/A

Test Voltage: N/A

#### 4.1.7 TEST RESULTS

Please refer to the Attachment A.

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.

## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 RADIATED EMISSION LIMITS (FCC 15.209)

| Frequencies (MHz) | Field Strength (micorvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009~0.490       | 2400/F(KHz)                       | 300                           |
| 0.490~1.705       | 24000/F(KHz)                      | 30                            |
| 1.705~30.0        | 30                                | 30                            |
| 30~88             | 100                               | 3                             |
| 88~216            | 150                               | 3                             |
| 216~960           | 200                               | 3                             |
| 960~1000          | 500                               | 3                             |

Harmonic emissions limits comply with below 54dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m) =  $20 \log$  Emission level (uV/m).
- (4) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain (if use)  
 Margin Level = Measurement Value - Limit Value

### LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.209)

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

Notes:

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

### LIMITS OF RADIATED EMISSION MEASUREMENT (FCC Part 15.249)

| FCC Part 15 (15.249), Subpart C                                          |                       |
|--------------------------------------------------------------------------|-----------------------|
| Limit                                                                    | Frequency Range (MHz) |
| Field strength of fundamental<br>50000 $\mu$ V/m (94 dB $\mu$ V/m) @ 3 m | 2400-2483.5           |
| Field strength of harmonics<br>500 $\mu$ V/m (54 dB $\mu$ V/m) @ 3 m     | Above 2483.5          |

| Spectrum Parameter | Setting               |
|--------------------|-----------------------|
| Attenuation        | Auto                  |
| Start Frequency    | 1000 MHz              |
| Stop Frequency     | 10th carrier harmonic |

| 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 TESTPROCEDURE**

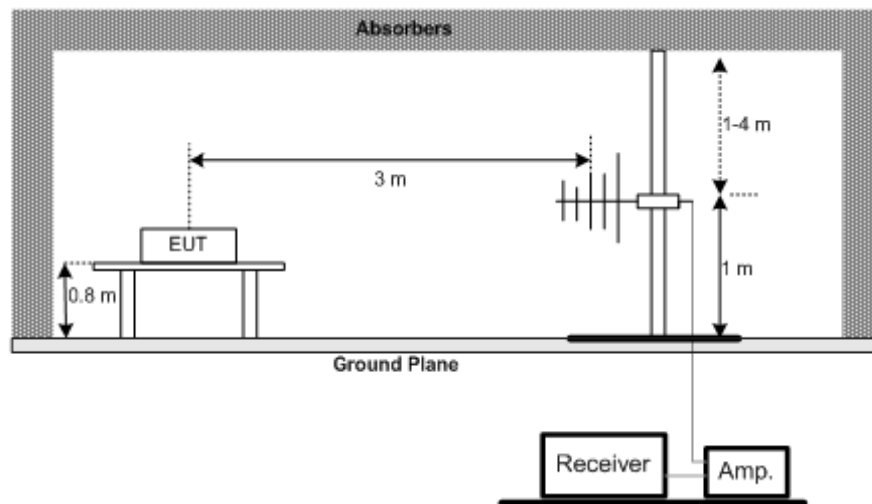
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 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 AV 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.
- g. The average value of fundamental frequency is:  
Average = Peak value +  $20\log(\text{Duty cycle})$  ,Final AV=PK-30.44

#### **4.2.3DEVIATIONFROMTESTSTANDARD**

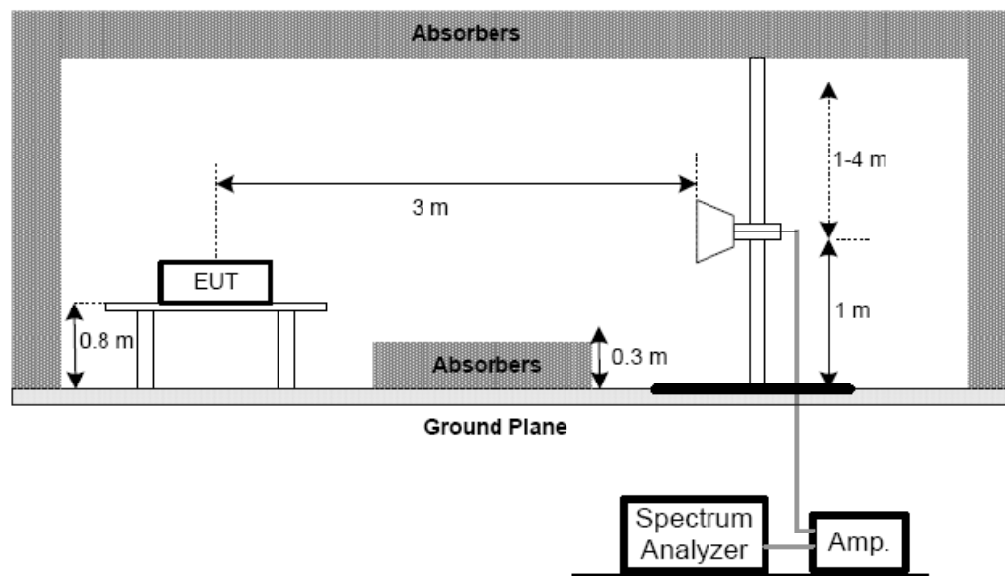
No deviation

#### 4.2.4 TESTSETUP

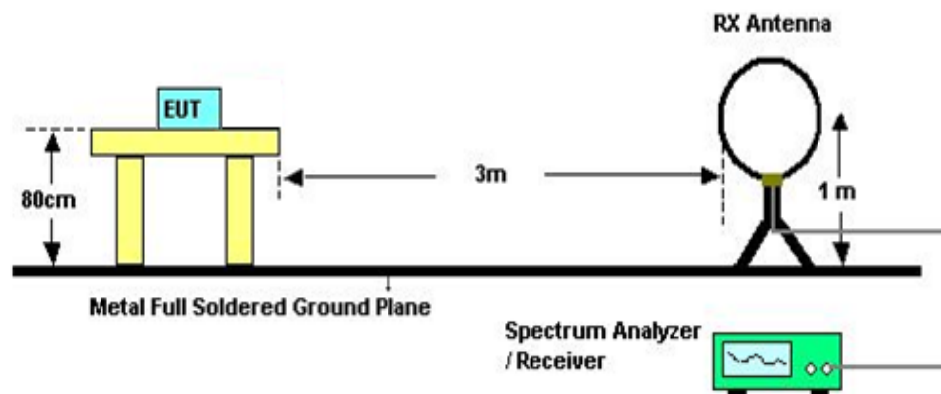
##### (A) Radiated Emission Test Set-Up Frequency Below 1 GHz



##### (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 4.1.6 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: DC 3V

#### 4.2.7 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Attachment B

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 =  $40 \log (\text{specific distance} / \text{test distance})$  (dB).
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

#### 4.2.8 TEST RESULTS (BETWEEN 30 – 1000 MHz)

Please refer to the Attachment C

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.
- (3) Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode or QP detector mode of the emission .

#### 4.2.9 TEST RESULTS (ABOVE 1000 MHz)

Please refer to the Attachment D

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) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (3) 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.
- (4) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (5) EUT Orthogonal Axis :  
“X” - denotes Laid on Table ; “Y” - denotes Vertical Stand ; “Z” - denotes Side Stand
- (6) 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
- (7) No limit: This is fundamental signal, the judgment is not applicable.  
For fundamental signal judgment was referred to Peak output test.

## **5.BANDWIDTH TEST**

### **5.1TEST 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.

### **5.2DEVIATION FROM STANDARD**

No deviation.

### **5.3TEST SETUP**



### **5.4EUT OPERATION CONDITIONS**

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

### **5.5EUT TEST CONDITIONS**

Temperature: 25°C  
Relative Humidity: 55%  
Test Voltage: DC 3V

### **5.6 TEST RESULTS**

Please refer to the Attachment E

## 6. ANTENNA CONDUCTED SPURIOUS EMISSION

### 6.1 APPLIED PROCEDURES / LIMIT

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

### 6.2 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 = 10 ms.

### 6.3 DEVIATION FROM STANDARD

No deviation.

### 6.4 TEST SETUP



#### **6.5 EUT OPERATION CONDITIONS**

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

#### **6.6 EUT TEST CONDITIONS**

Temperature: 25°C  
Relative Humidity: 55%  
Test Voltage: DC 3V

#### **6.7 TEST RESULTS**

Please refer to the Attachment F

## 7.MEASUREMENT INSTRUMENTS LIST AND SETTING

| Radiated Emission Measurement |                         |                    |              |            |                  |
|-------------------------------|-------------------------|--------------------|--------------|------------|------------------|
| Item                          | Kind of Equipment       | Manufacturer       | Type No.     | Serial No. | Calibrated until |
| 1                             | Spectrum Analyzer       | R&S                | FSP-30       | 100854     | Oct. 26, 2015    |
| 2                             | Horn Antenna            | Schwarzbeck        | BBHA 9120    | D-325      | Jun. 14, 2015    |
| 3                             | Microwave Pre_amplifier | Agilent            | 8449B        | 3008A01714 | Apr. 15, 2015    |
| 4                             | Microflex Cable         | Harbour industries | 27478LL142   | 1m         | May. 12, 2015    |
| 5                             | Microflex Cable         | EMC                | S104-SMA     | 8m         | May. 14, 2015    |
| 6                             | Microflex Cable         | Harbour industries | 27478LL142   | 3m         | May. 12, 2015    |
| 7                             | Test Cable              | LMR                | LMR-400      | 12m        | May. 13, 2015    |
| 8                             | Test Cable              | LMR                | LMR-400      | 3m         | May. 13, 2015    |
| 9                             | Pre-Amplifier           | Anritsu            | MH648A       | M92649     | Jun. 17, 2015    |
| 10                            | Log-Bicon Antenna       | Schwarzbeck        | VULB9168-352 | 9168-352   | July. 10, 2015   |

| Bandwidth |                   |              |          |            |                  |
|-----------|-------------------|--------------|----------|------------|------------------|
| Item      | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1         | Spectrum Analyzer | R&S          | FSP-30   | 100854     | Oct. 26, 2015    |

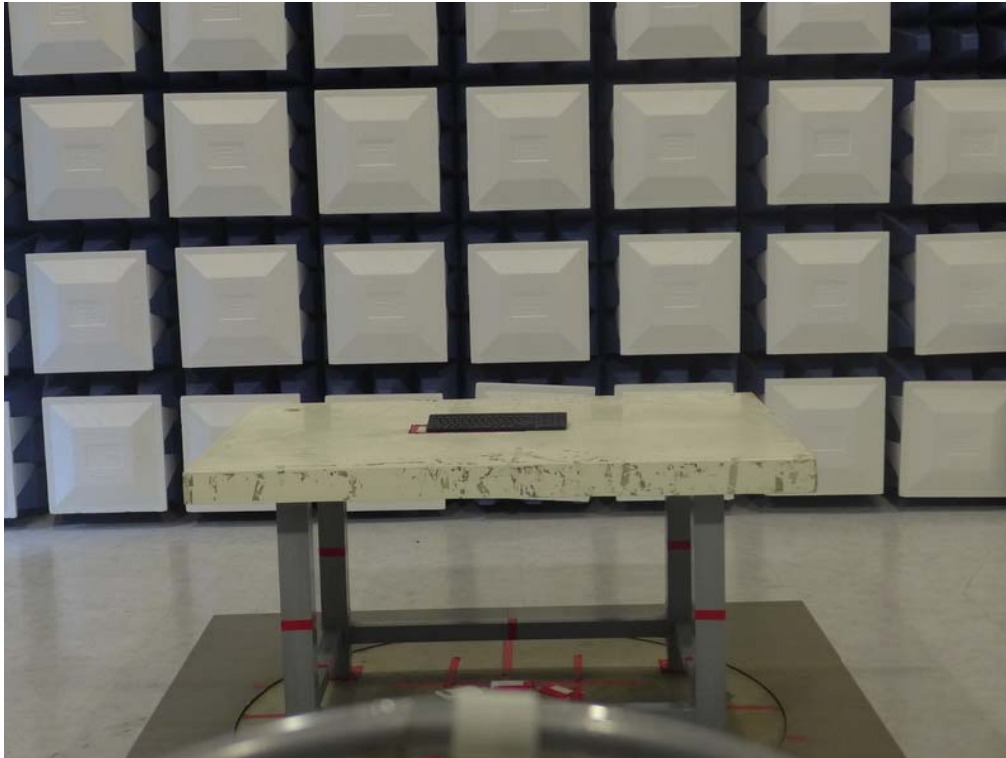
| Antenna Conducted Spurious Emission |                   |              |          |            |                  |
|-------------------------------------|-------------------|--------------|----------|------------|------------------|
| Item                                | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1                                   | Spectrum Analyzer | R&S          | FSP-30   | 100854     | Oct. 26, 2015    |

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

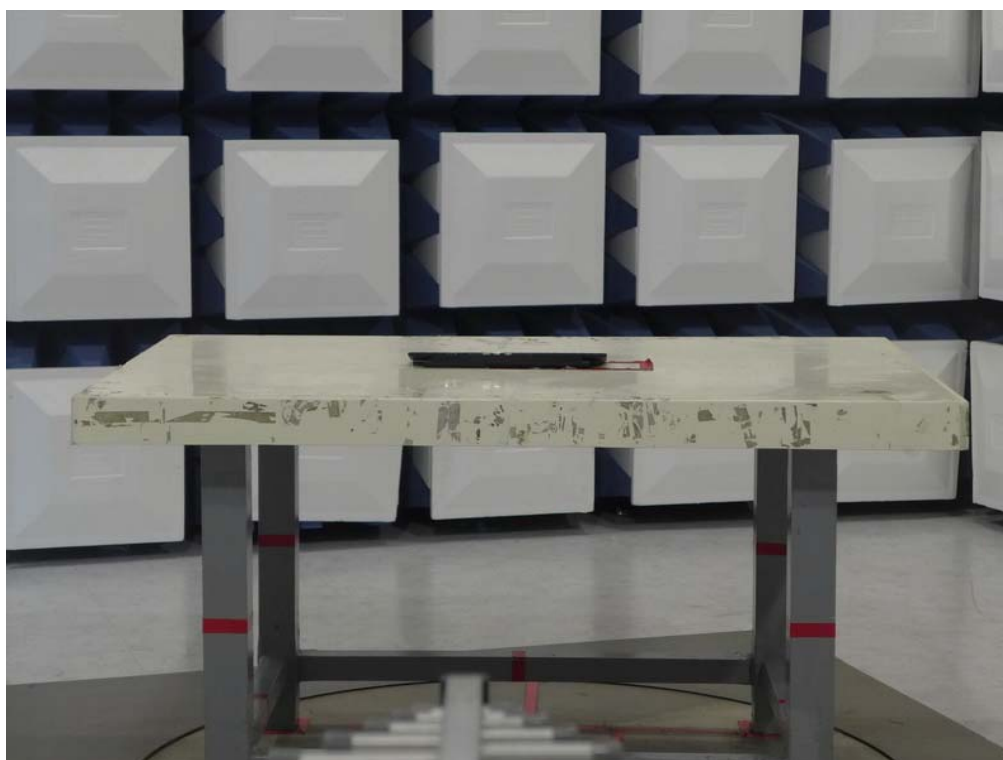
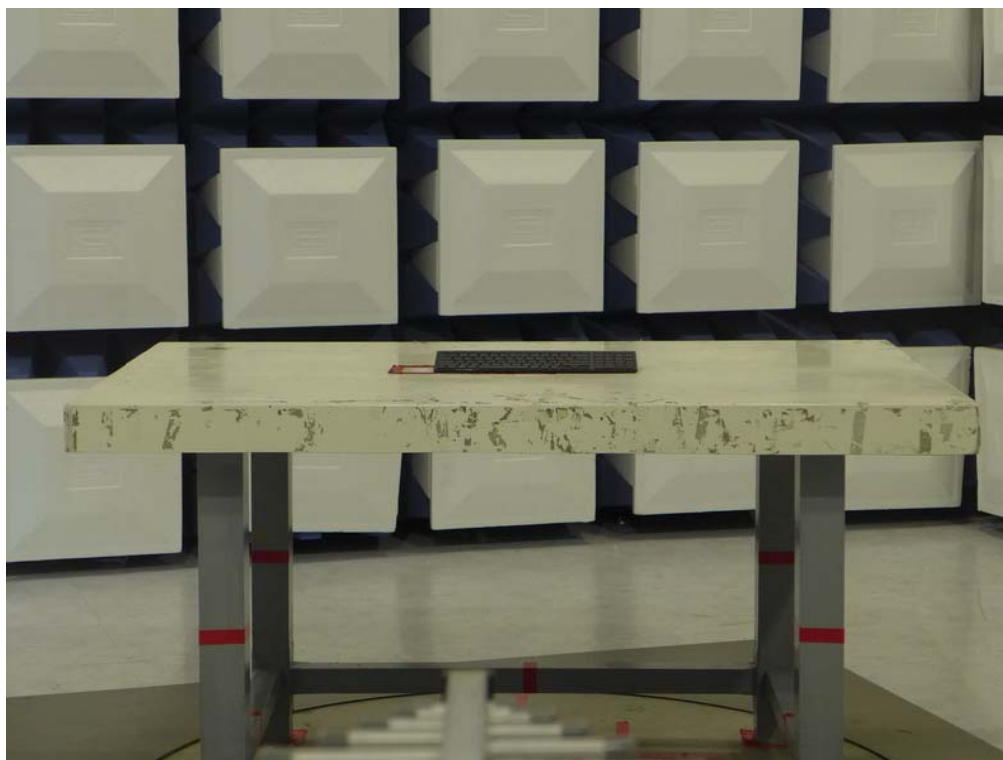
## 8.EUT TEST PHOTO

### Radiated Measurement Photos

9KHz to 30MHz

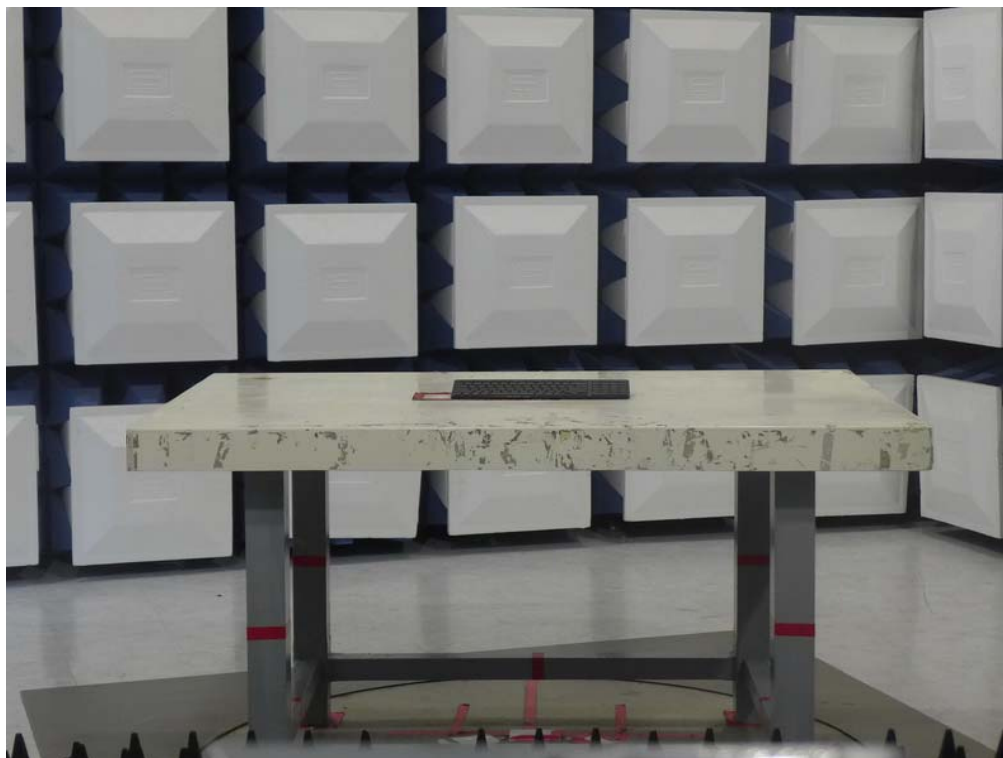


**Radiated Measurement Photos**  
**30MHz to 1000MHz**



## Radiated Measurement Photos

Above 1000MHz



## ATTACHMENT A - CONDUCTED EMISSION

**Test Mode: N/A**

Note: "N/A" denotes test is not applicable to this device.

## **ATTACHMENT B - RADIATED EMISSION (9KHZ-30MHZ)**

Test Mode: TX Mode

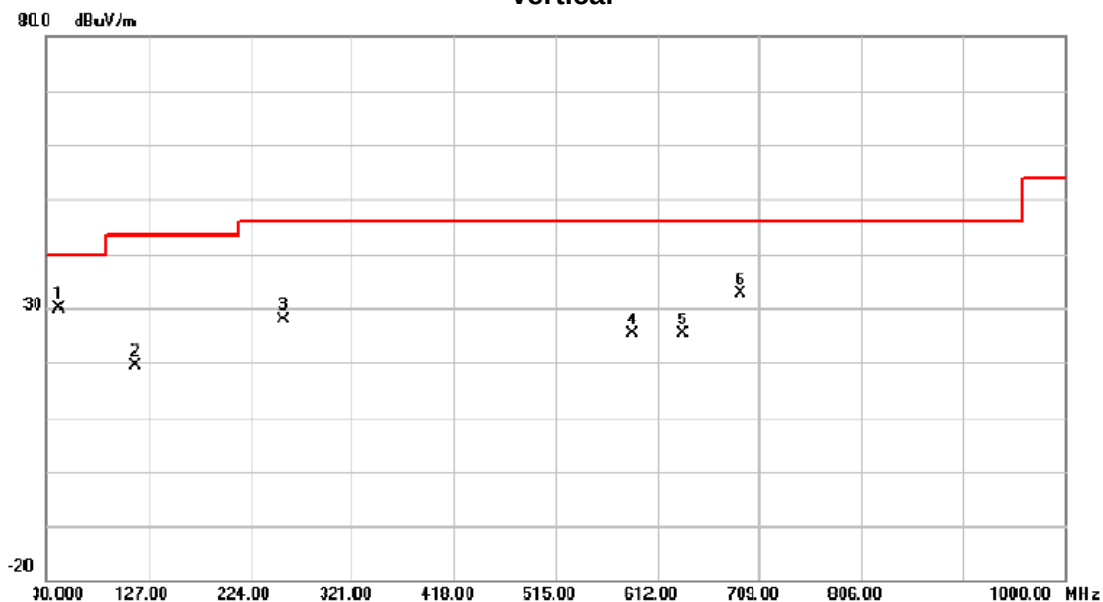
| Freq.<br>(MHz) | Ant.<br>0°/90° | Reading(RA)<br>(dBuV) | Corr.Factor(CF)<br>(dB) | Measured(FS)<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Note |
|----------------|----------------|-----------------------|-------------------------|--------------------------|--------------------|----------------|------|
| 0.2440         | 0°             | 46.88                 | 11.45                   | 58.33                    | 79.86              | -21.52         | AVG  |
| 0.2440         | 0°             | 57.24                 | 11.45                   | 68.69                    | 99.86              | -31.16         | PK   |
| 0.3650         | 0°             | 40.36                 | 11.14                   | 51.50                    | 76.36              | -24.86         | AVG  |
| 0.3650         | 0°             | 49.84                 | 11.14                   | 60.98                    | 96.36              | -35.38         | PK   |
| 0.3860         | 0°             | 41.45                 | 11.15                   | 52.60                    | 75.87              | -23.27         | AVG  |
| 0.3860         | 0°             | 50.29                 | 11.15                   | 61.44                    | 95.87              | -34.43         | PK   |
| 0.6470         | 0°             | 43.22                 | 11.30                   | 54.52                    | 90.55              | -36.03         | QP   |
| 0.7740         | 0°             | 42.41                 | 11.33                   | 53.74                    | 69.83              | -16.09         | QP   |
| 1.3360         | 0°             | 40.69                 | 11.52                   | 52.21                    | 65.09              | -12.88         | QP   |

| Freq.<br>(MHz) | Ant.<br>0°/90° | Reading(RA)<br>(dBuV) | Corr.Factor(CF)<br>(dB) | Measured(FS)<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Note |
|----------------|----------------|-----------------------|-------------------------|--------------------------|--------------------|----------------|------|
| 0.2475         | 90°            | 47.85                 | 11.43                   | 59.28                    | 79.73              | -20.45         | AVG  |
| 0.2475         | 90°            | 58.63                 | 11.43                   | 70.06                    | 99.73              | -29.67         | PK   |
| 0.362          | 90°            | 40.11                 | 11.13                   | 51.24                    | 76.43              | -25.19         | AVG  |
| 0.362          | 90°            | 50.36                 | 11.13                   | 61.49                    | 96.43              | -34.94         | PK   |
| 0.399          | 90°            | 41.49                 | 11.16                   | 52.65                    | 75.58              | -22.94         | AVG  |
| 0.399          | 90°            | 50.67                 | 11.16                   | 61.83                    | 95.58              | -33.76         | PK   |
| 0.625          | 90°            | 43.55                 | 11.30                   | 54.85                    | 90.55              | -35.70         | QP   |
| 0.778          | 90°            | 42.11                 | 11.33                   | 53.44                    | 69.78              | -16.34         | QP   |
| 1.349          | 90°            | 40.36                 | 11.52                   | 51.88                    | 65.00              | -13.12         | QP   |

## **ATTACHMENT C -RADIATED EMISSION (30MHZ TO 1000MHZ)**

Test Mode: TX Middle Channel

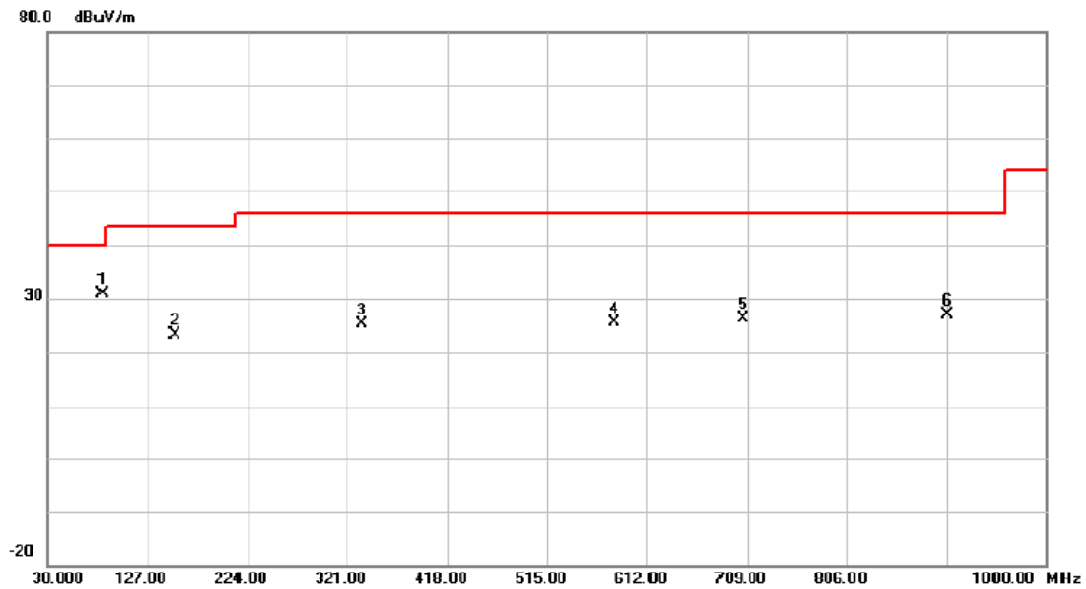
### Vertical



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1   | *   | 42.1250      | 43.98                    | -13.98                  | 30.00                      | 40.00           | -10.00       | peak     |         |
| 2   |     | 114.8750     | 36.08                    | -16.78                  | 19.30                      | 43.50           | -24.20       | peak     |         |
| 3   |     | 255.5250     | 42.59                    | -14.82                  | 27.77                      | 46.00           | -18.23       | peak     |         |
| 4   |     | 587.7500     | 32.61                    | -7.59                   | 25.02                      | 46.00           | -20.98       | peak     |         |
| 5   |     | 636.2500     | 32.22                    | -7.05                   | 25.17                      | 46.00           | -20.83       | peak     |         |
| 6   |     | 689.6000     | 38.27                    | -5.74                   | 32.53                      | 46.00           | -13.47       | peak     |         |

Test Mode: TX Middle Channel

### Horizontal

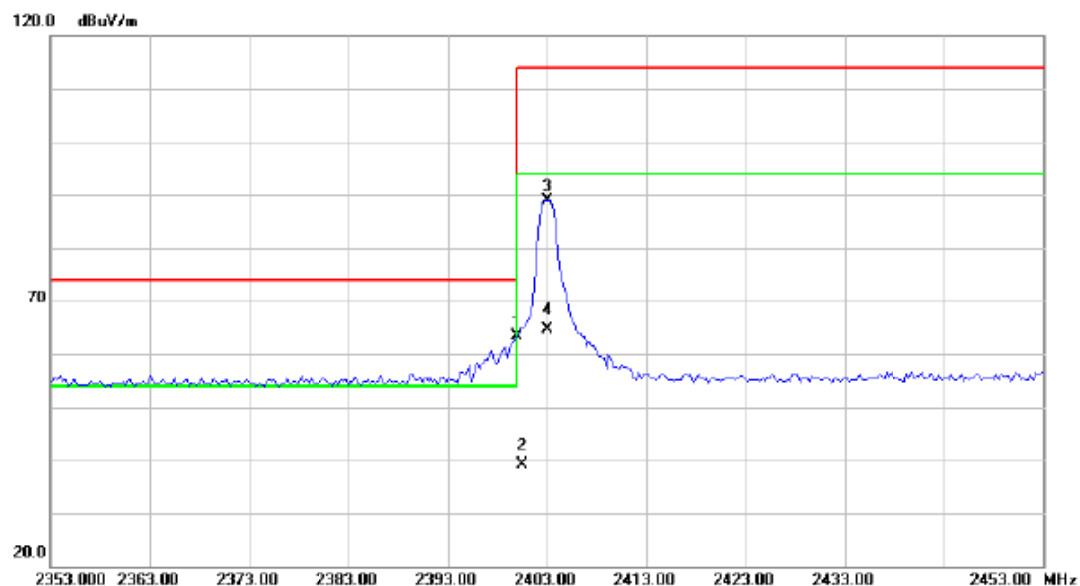


| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit  | Margin |          |         |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dBuV/m | dB     | Detector | Comment |
| 1   | *   | 83.3500  | 49.78         | -18.86         | 30.92        | 40.00  | -9.08  | peak     |         |
| 2   |     | 153.6750 | 37.21         | -14.00         | 23.21        | 43.50  | -20.29 | peak     |         |
| 3   |     | 335.5500 | 37.67         | -12.57         | 25.10        | 46.00  | -20.90 | peak     |         |
| 4   |     | 580.4750 | 32.92         | -7.66          | 25.26        | 46.00  | -20.74 | peak     |         |
| 5   |     | 704.1500 | 31.56         | -5.39          | 26.17        | 46.00  | -19.83 | peak     |         |
| 6   |     | 903.0000 | 29.66         | -2.77          | 26.89        | 46.00  | -19.11 | peak     |         |

## **ATTACHMENT D -RADIATED EMISSION (ABOVE 1000MHZ)**

|                   |                |
|-------------------|----------------|
| Orthogonal Axis : | X              |
| Test Mode :       | TX Low Channel |

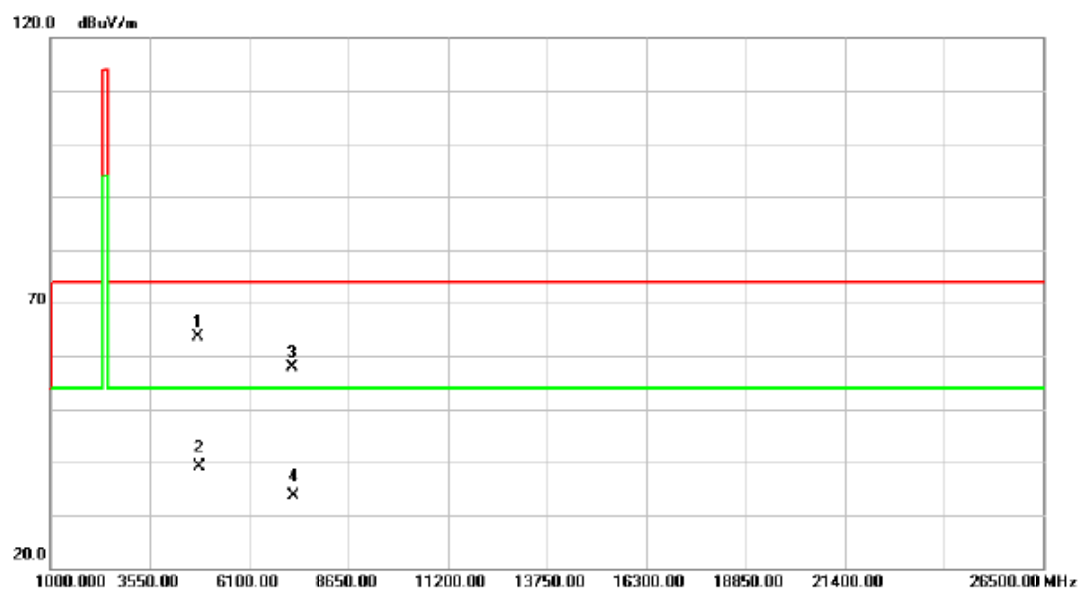
### Vertical



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1   | *   | 2400.000     | 32.39                    | 31.07                   | 63.46                      | 74.00           | -10.54       | peak     |          |
| 2   |     | 2400.000     | 7.97                     | 31.07                   | 39.04                      | 54.00           | -14.96       | AVG      |          |
| 3   |     | 2403.000     | 57.87                    | 31.08                   | 88.95                      | 114.0           | -25.05       | peak     | No Limit |
| 4   |     | 2403.000     | 33.45                    | 31.08                   | 64.53                      | 94.00           | -29.47       | AVG      | No Limit |

|                   |                |
|-------------------|----------------|
| Orthogonal Axis : | X              |
| Test Mode :       | TX Low Channel |

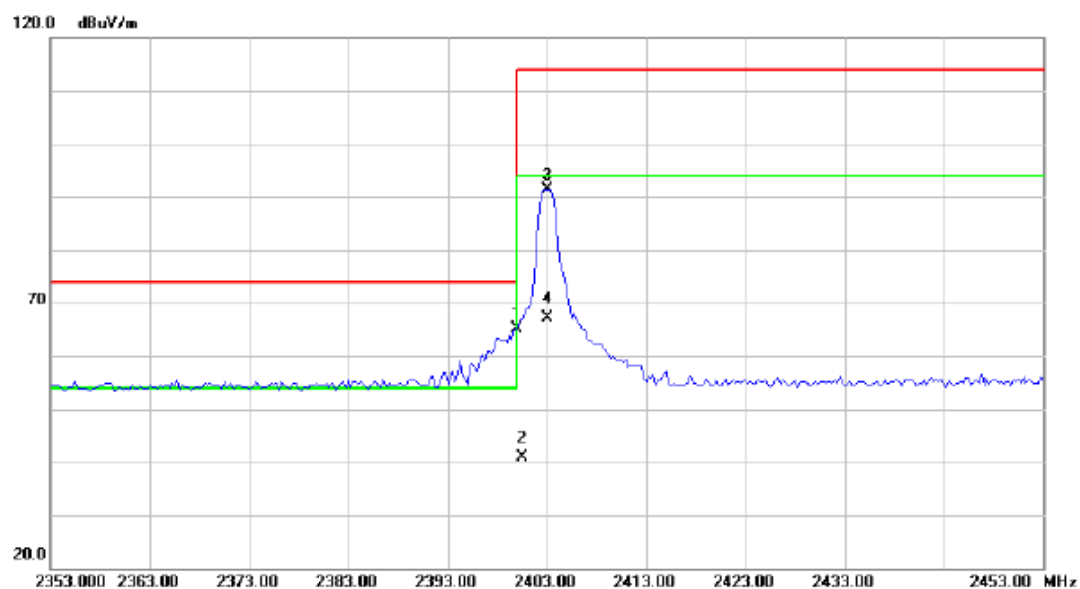
### Vertical



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1   | *   | 4806.012     | 56.85                    | 6.78                    | 63.63                      | 74.00           | -10.37       | peak     |         |
| 2   |     | 4806.012     | 32.43                    | 6.78                    | 39.21                      | 54.00           | -14.79       | AVG      |         |
| 3   |     | 7208.538     | 42.92                    | 15.03                   | 57.95                      | 74.00           | -16.05       | peak     |         |
| 4   |     | 7208.538     | 18.49                    | 15.03                   | 33.52                      | 54.00           | -20.48       | AVG      |         |

|                   |                |
|-------------------|----------------|
| Orthogonal Axis : | X              |
| Test Mode :       | TX Low Channel |

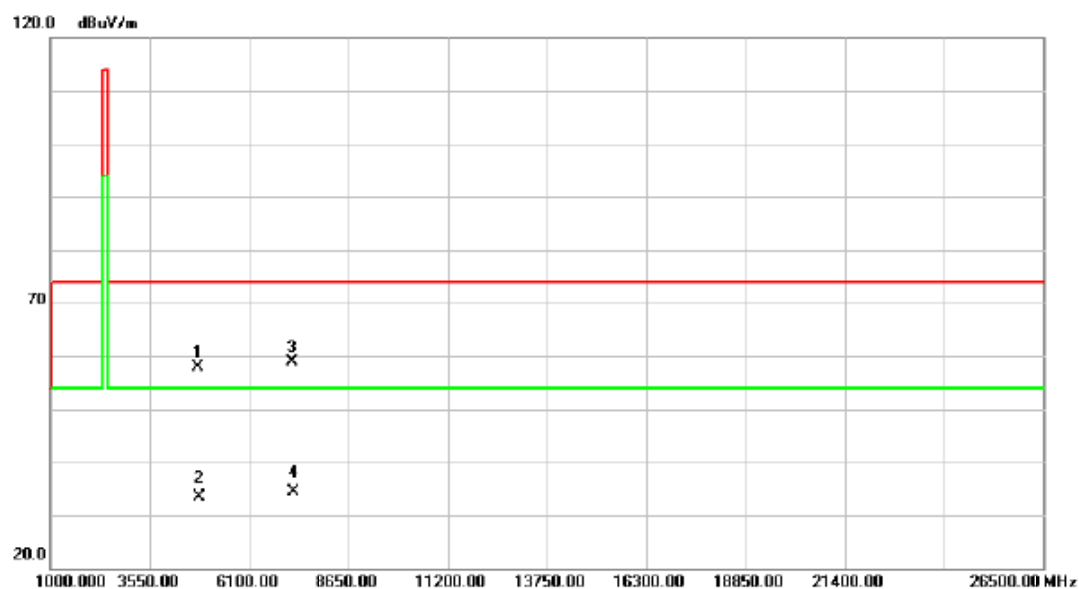
### Horizontal



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1   | *   | 2400.000     | 34.17                    | 31.07                   | 65.24                      | 74.00           | -8.76        | peak     |          |
| 2   |     | 2400.000     | 9.75                     | 31.07                   | 40.82                      | 54.00           | -13.18       | AVG      |          |
| 3   |     | 2403.000     | 60.36                    | 31.08                   | 91.44                      | 114.00          | -22.56       | peak     | No Limit |
| 4   |     | 2403.000     | 35.94                    | 31.08                   | 67.02                      | 94.00           | -26.98       | AVG      | No Limit |

|                   |                |
|-------------------|----------------|
| Orthogonal Axis : | X              |
| Test Mode :       | TX Low Channel |

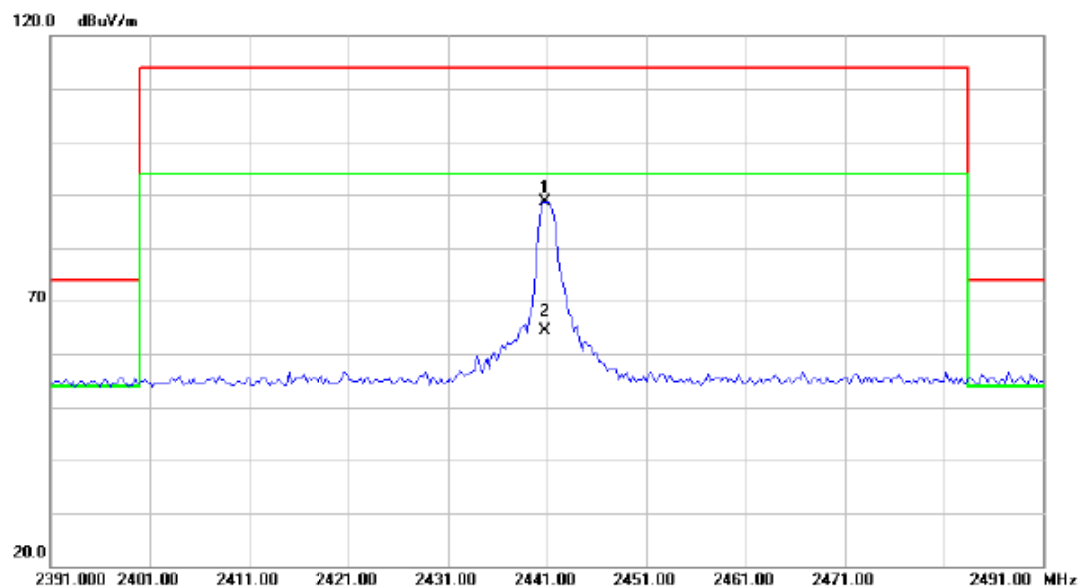
### Horizontal



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1   |     | 4805.462     | 51.11                    | 6.78                    | 57.89                      | 74.00           | -16.11       | peak     |         |
| 2   |     | 4805.462     | 26.69                    | 6.78                    | 33.47                      | 54.00           | -20.53       | AVG      |         |
| 3   | *   | 7207.800     | 43.83                    | 15.03                   | 58.86                      | 74.00           | -15.14       | peak     |         |
| 4   |     | 7207.800     | 19.41                    | 15.03                   | 34.44                      | 54.00           | -19.56       | AVG      |         |

|                   |                   |
|-------------------|-------------------|
| Orthogonal Axis : | X                 |
| Test Mode :       | TX Middle Channel |

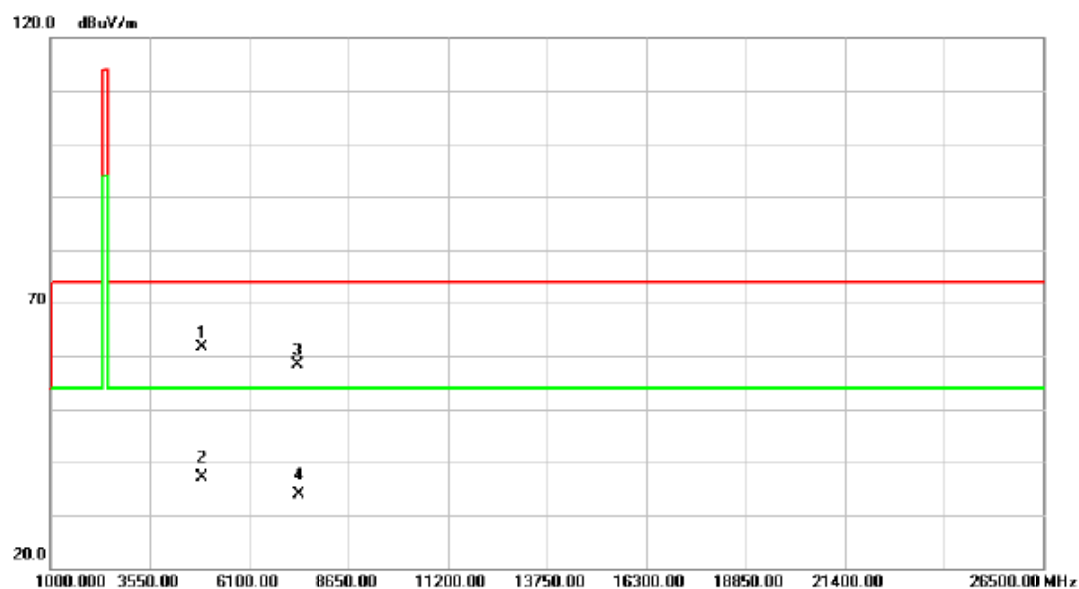
### Vertical



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Margin |          |          |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|----------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector | Comment  |
| 1   | *   | 2440.750 | 57.49         | 31.26          | 88.75       | 114.0  | -25.25 | peak     | No Limit |
| 2   |     | 2440.750 | 33.07         | 31.26          | 64.33       | 94.00  | -29.67 | AVG      | No Limit |

|                   |                   |
|-------------------|-------------------|
| Orthogonal Axis : | X                 |
| Test Mode :       | TX Middle Channel |

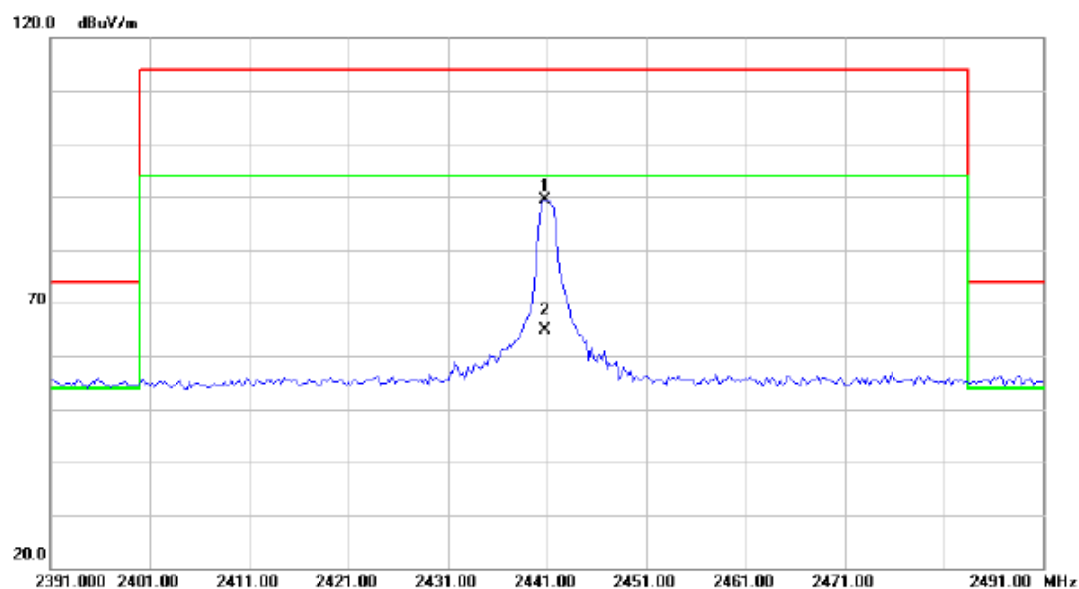
### Vertical



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1   | *   | 4881.450     | 54.84                    | 6.77                    | 61.61                      | 74.00           | -12.39       | peak     |         |
| 2   |     | 4881.450     | 30.41                    | 6.77                    | 37.18                      | 54.00           | -16.82       | AVG      |         |
| 3   |     | 7327.300     | 42.70                    | 15.67                   | 58.37                      | 74.00           | -15.63       | peak     |         |
| 4   |     | 7327.300     | 18.27                    | 15.67                   | 33.94                      | 54.00           | -20.06       | AVG      |         |

|                   |                   |
|-------------------|-------------------|
| Orthogonal Axis : | X                 |
| Test Mode :       | TX Middle Channel |

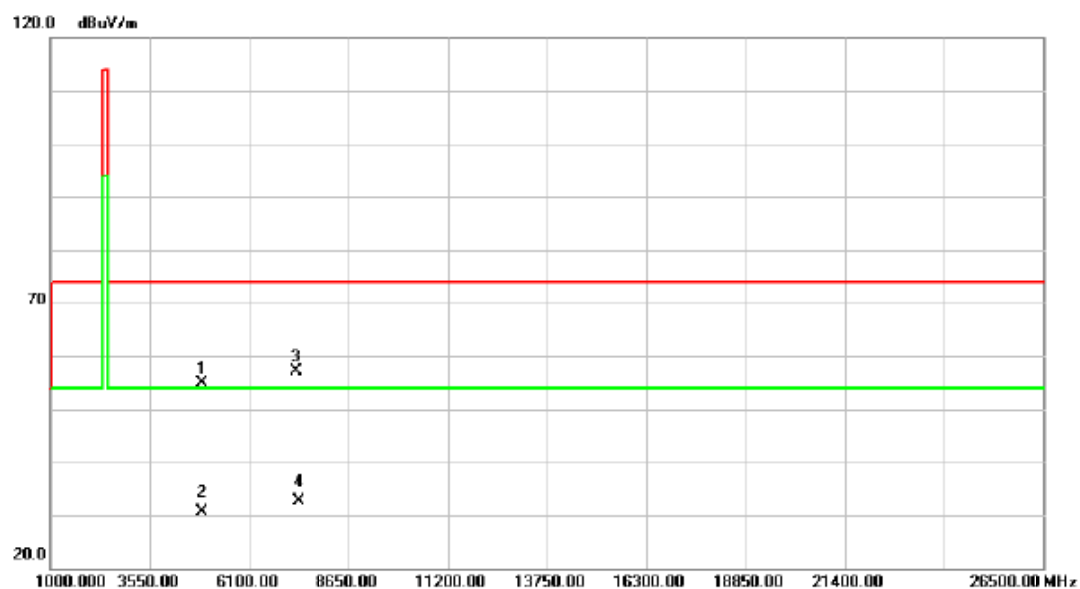
### Horizontal



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1   | *   | 2440.750     | 58.16                    | 31.26                   | 89.42                      | 114.0           | -24.58       | peak     | No Limit |
| 2   |     | 2440.750     | 33.74                    | 31.26                   | 65.00                      | 94.00           | -29.00       | AVG      | No Limit |

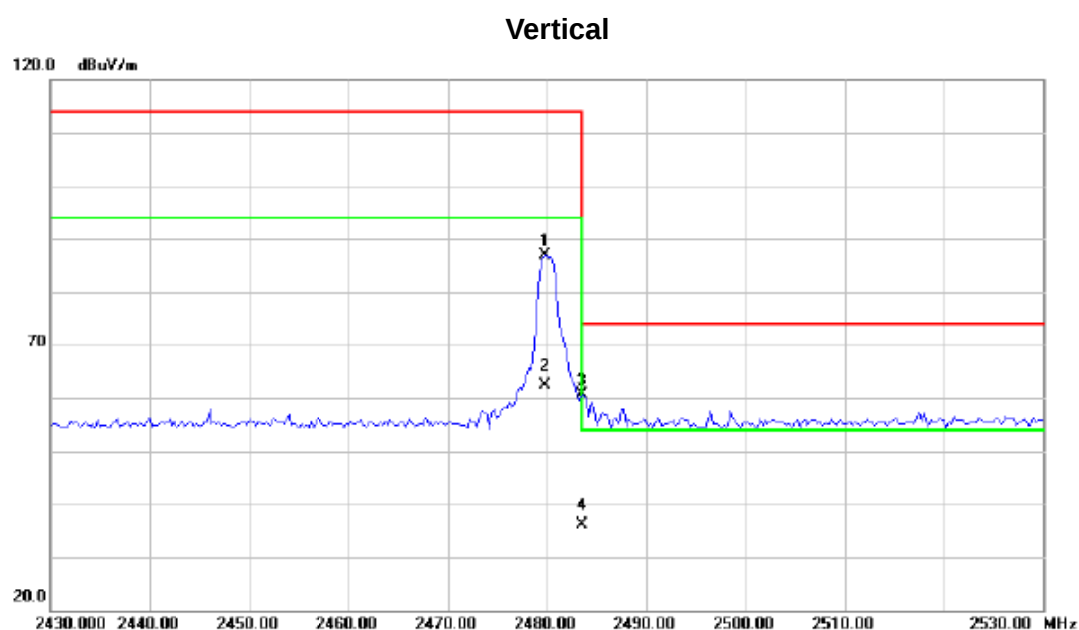
|                   |                   |
|-------------------|-------------------|
| Orthogonal Axis : | X                 |
| Test Mode :       | TX Middle Channel |

### Horizontal



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1   |     | 4881.913     | 48.17                    | 6.77                    | 54.94                      | 74.00           | -19.06       | peak     |         |
| 2   |     | 4881.913     | 23.75                    | 6.77                    | 30.52                      | 54.00           | -23.48       | AVG      |         |
| 3   | *   | 7321.950     | 41.45                    | 15.65                   | 57.10                      | 74.00           | -16.90       | peak     |         |
| 4   |     | 7321.950     | 17.03                    | 15.65                   | 32.68                      | 54.00           | -21.32       | AVG      |         |

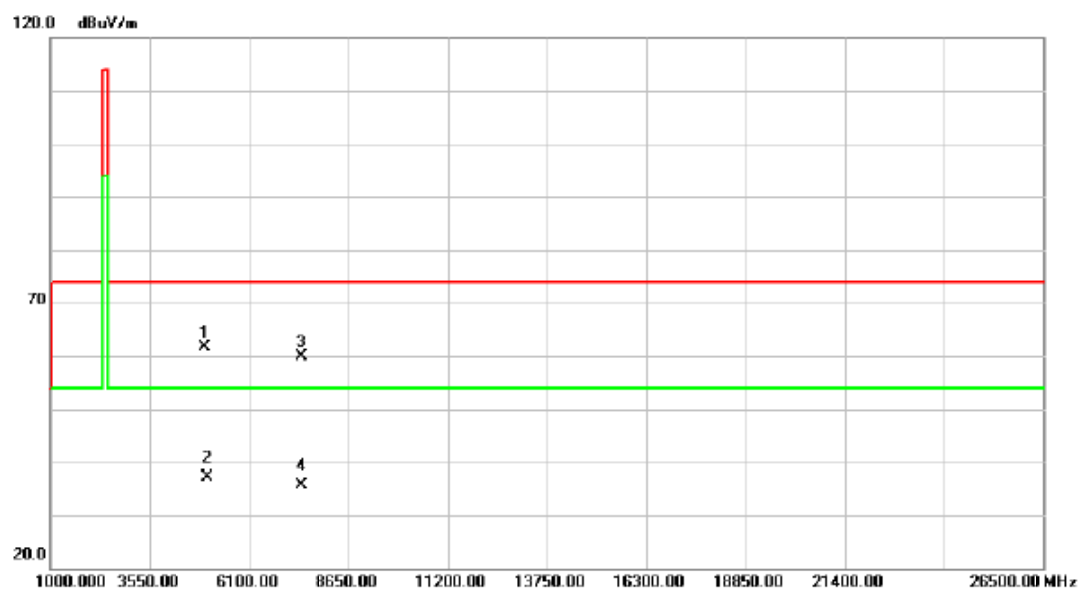
|                   |                 |
|-------------------|-----------------|
| Orthogonal Axis : | X               |
| Test Mode :       | TX High Channel |



| No. Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|---------|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1       | 2479.750     | 55.35                    | 31.44                   | 86.79                      | 114.0           | -27.21       | peak     | No Limit |
| 2       | 2479.750     | 30.93                    | 31.44                   | 62.37                      | 94.00           | -31.63       | AVG      | No Limit |
| 3 *     | 2483.500     | 29.17                    | 31.46                   | 60.63                      | 74.00           | -13.37       | peak     |          |
| 4       | 2483.500     | 4.75                     | 31.46                   | 36.21                      | 54.00           | -17.79       | AVG      |          |

|                   |                 |
|-------------------|-----------------|
| Orthogonal Axis : | X               |
| Test Mode :       | TX High Channel |

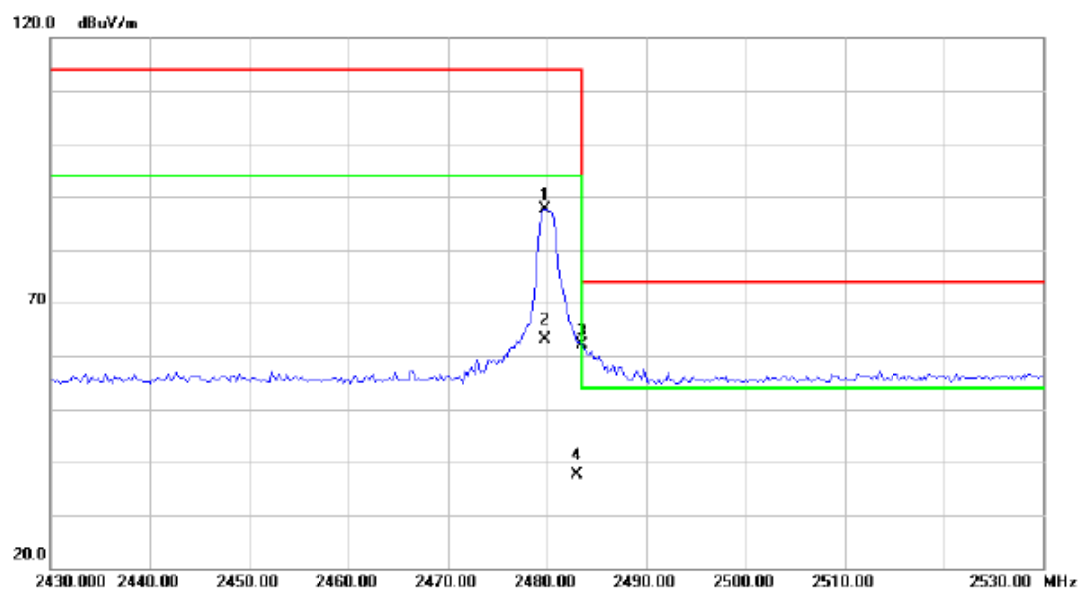
### Vertical



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1   | *   | 4960.012     | 54.91                    | 6.76                    | 61.67                      | 74.00           | -12.33       | peak     |         |
| 2   |     | 4960.012     | 30.49                    | 6.76                    | 37.25                      | 54.00           | -16.75       | AVG      |         |
| 3   |     | 7438.175     | 43.68                    | 16.26                   | 59.94                      | 74.00           | -14.06       | peak     |         |
| 4   |     | 7438.175     | 19.25                    | 16.26                   | 35.51                      | 54.00           | -18.49       | AVG      |         |

|                   |                 |
|-------------------|-----------------|
| Orthogonal Axis : | X               |
| Test Mode :       | TX High Channel |

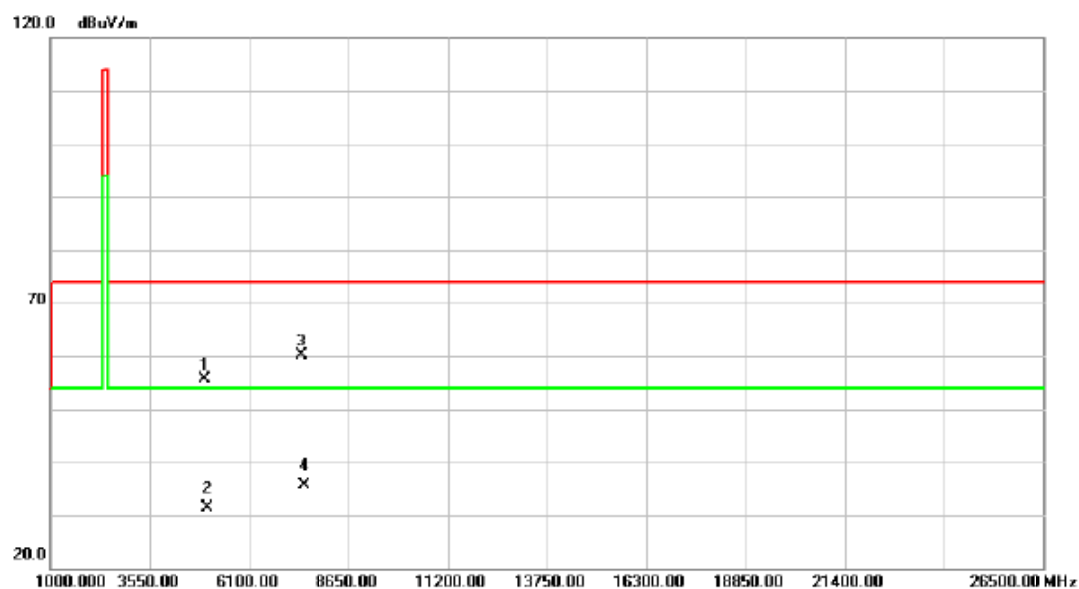
### Horizontal



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1   |     | 2479.750     | 56.15                    | 31.44                   | 87.59                      | 114.0           | -26.41       | peak     | No Limit |
| 2   |     | 2479.750     | 31.73                    | 31.44                   | 63.17                      | 94.00           | -30.83       | AVG      | No Limit |
| 3   | *   | 2483.500     | 30.65                    | 31.46                   | 62.11                      | 74.00           | -11.89       | peak     |          |
| 4   |     | 2483.500     | 6.23                     | 31.46                   | 37.69                      | 54.00           | -16.31       | AVG      |          |

|                   |                 |
|-------------------|-----------------|
| Orthogonal Axis : | X               |
| Test Mode :       | TX High Channel |

### Horizontal

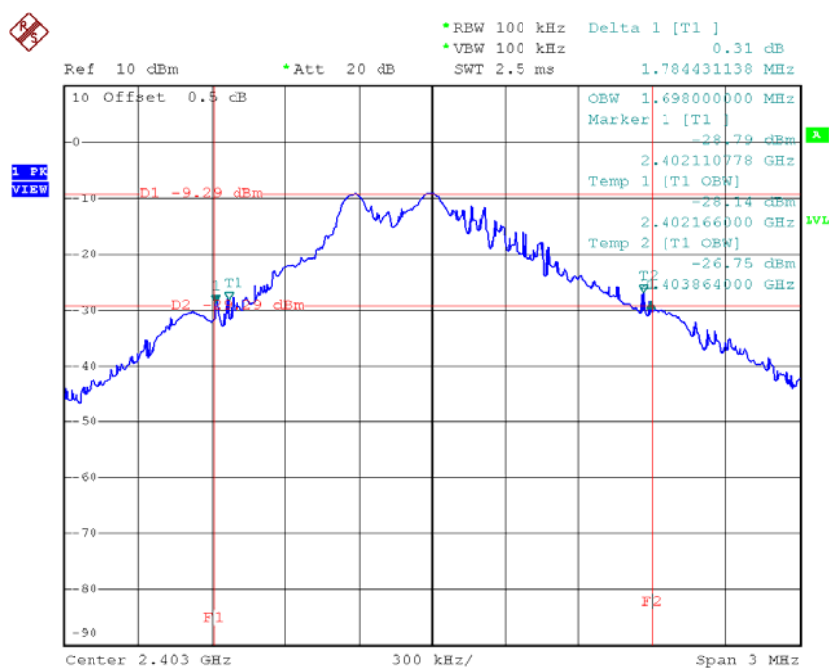


| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1   |     | 4959.325     | 48.97                    | 6.76                    | 55.73                      | 74.00           | -18.27       | peak     |         |
| 2   |     | 4959.325     | 24.54                    | 6.76                    | 31.30                      | 54.00           | -22.70       | AVG      |         |
| 3   | *   | 7439.925     | 43.75                    | 16.28                   | 60.03                      | 74.00           | -13.97       | peak     |         |
| 4   |     | 7439.925     | 19.32                    | 16.28                   | 35.60                      | 54.00           | -18.40       | AVG      |         |

## **ATTACHMENT E - BANDWIDTH**

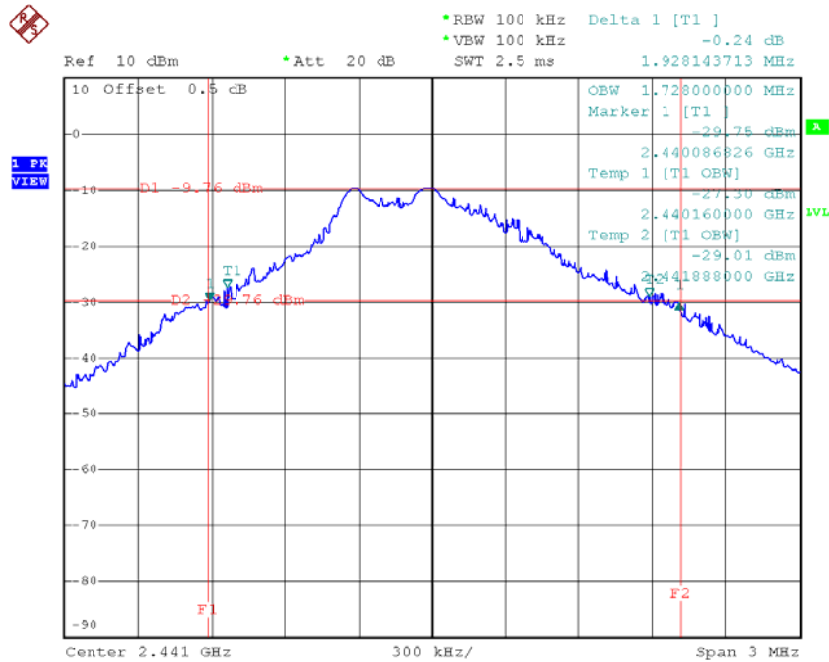
| Frequency<br>(MHz) | 20dB Bandwidth<br>(MHz) | 99% Occupied<br>BW(MHz) |
|--------------------|-------------------------|-------------------------|
| 2403.0             | 1.78                    | 1.70                    |
| 2441.0             | 1.93                    | 1.73                    |
| 2480.0             | 1.74                    | 1.64                    |

### TX Low Channel



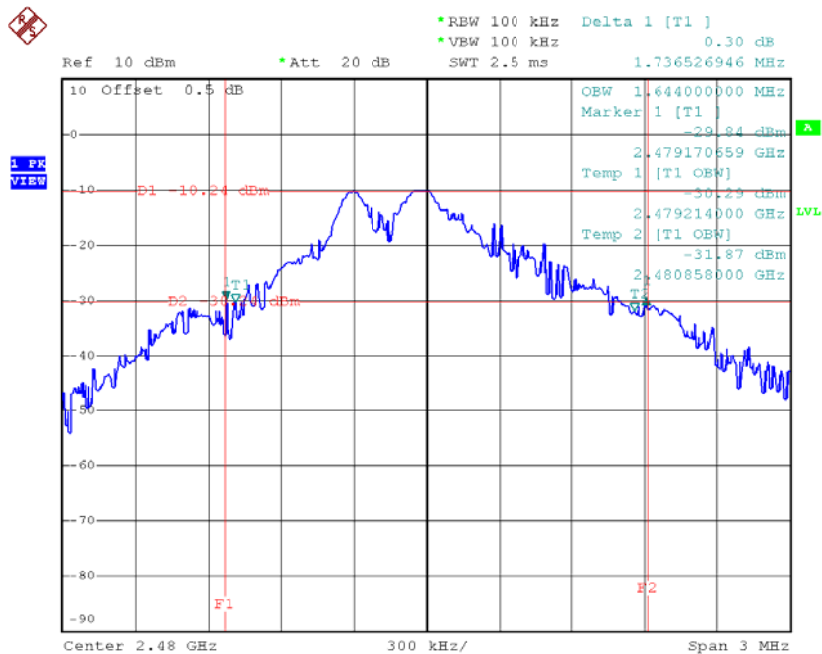
Date: 5.MAR.2015 13:23:34

### TX Middle Channel



Date: 5.MAR.2015 18:34:13

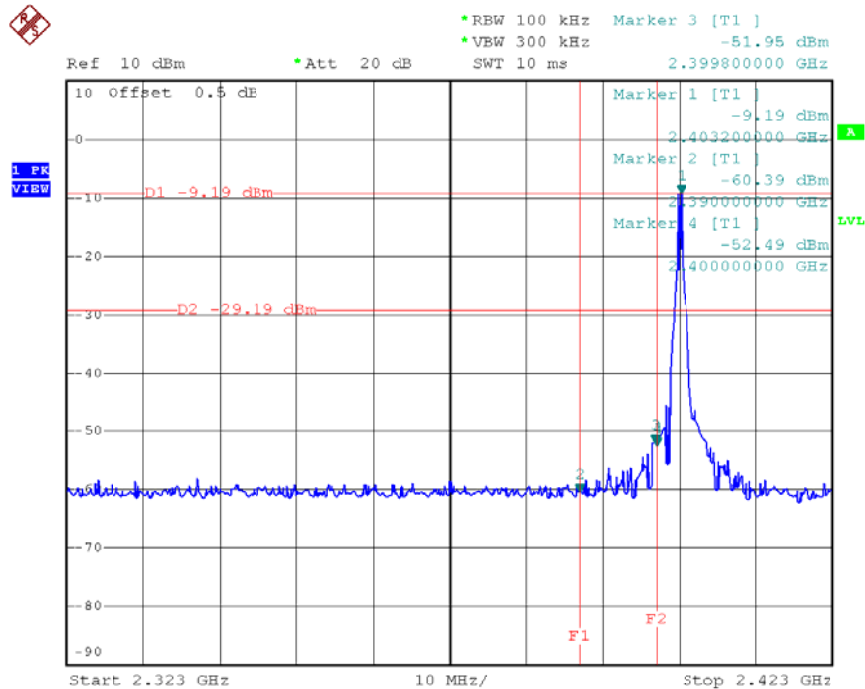
### TX High Channel



Date: 5.MAR.2015 18:36:29

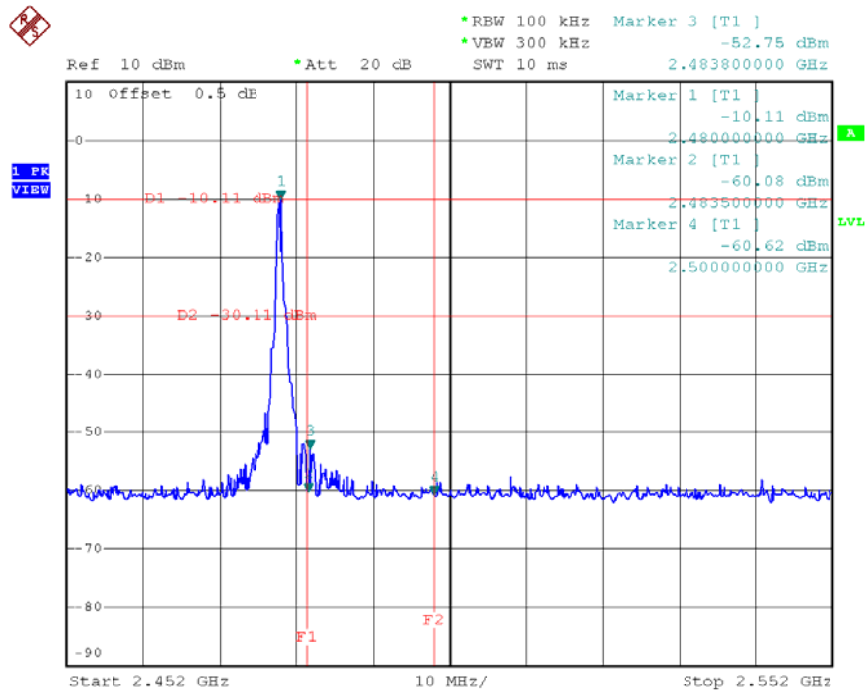
## **ATTACHMENT F - ANTENNA CONDUCTED SPURIOUS EMISSION**

### TX Low Channel(Lower)



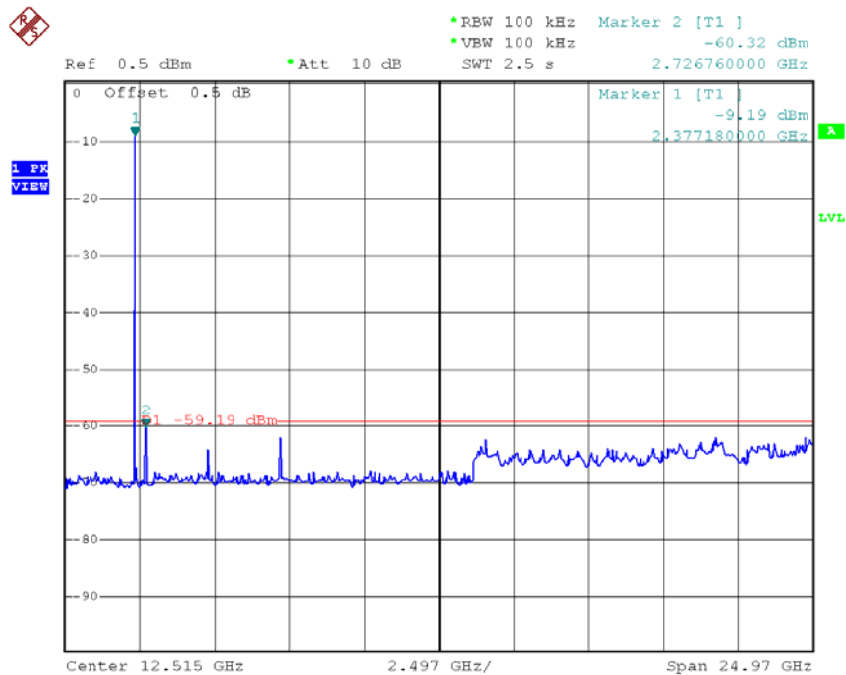
Date: 5.MAR.2015 18:23:59

### TX HighChannel (Upper)



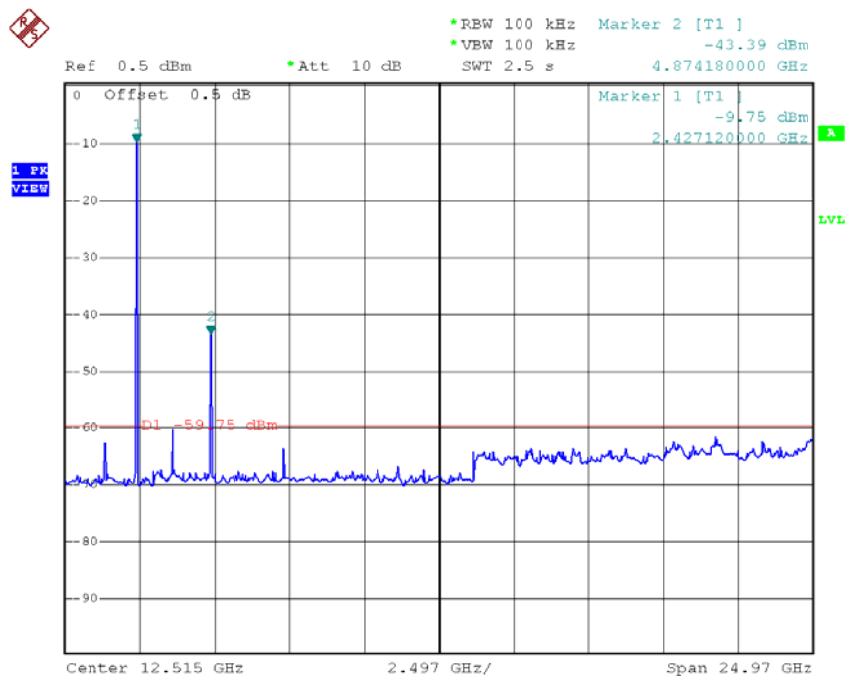
Date: 5.MAR.2015 18:36:50

### TX Low Channel (10 Harmonic of the frequency)



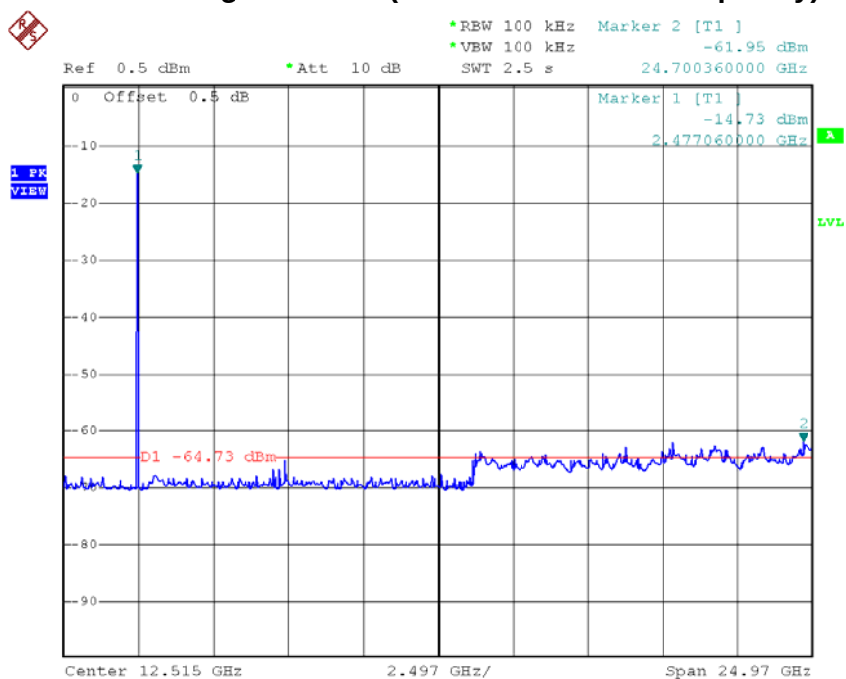
Date: 5.MAR.2015 18:44:12

### TX Middle Channel (10 Harmonic of the frequency)



Date: 5.MAR.2015 18:48:25

# TX High Channel (10 Harmonic of the frequency)



Date: 5.MAR.2015 18:53:58