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No.L1659

# FCC Part 15C (Wi-Fi) TEST REPORT

*of*

## GSM 850/900/1800/1900 GPRS Mobile Phone

FCC ID: UJQ-06378T

Model No.: Pean

Serial No.: 1041608000001261

Report No.: FCC06-8084

Date: October 24, 2006

*Prepared for*

### Techfaith Wireless Communication Technology Limited

2/FM8 West, No.1 Jiu Xian Qiao Dong Road, Chao Yang District,  
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## 1 Test Report Certification

**Product:** GSM 850/900/1800/1900 GPRS Mobile Phone

**FCC ID:** UJQ-06378T

**Model No.:** Pean

**Applicant:** Techfaith Wireless Communication Technology Limited

**Applicant Address:** 2/FM8 West, No.1 Jiu Xian Qiao Dong Road, Chao Yang District,  
Beijing, 100016, China

**Manufacturer:** Techfaith Wireless Communication Technology Limited

**Manufacturer Address:** 2/FM8 West, No.1 Jiu Xian Qiao Dong Road, Chao Yang District,  
Beijing, 100016, China

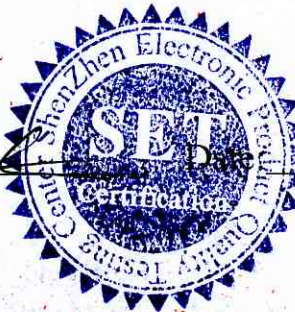
**Test Standards:** 47 CFR Part 15, Subpart C

**Test Result:** PASS

We, Shenzhen Electronic Product Quality Testing Center, hereby certify that the submitted samples of the above item, as detailed in chapter 2.1 of this report, has been tested in our facility. The test record, data evaluation and test configuration represented herein are true and accurate accounts of measurements of the sample's EMC characteristics under the conditions herein specified.

Tested by: Lin Xingsun, Date: Oct. 24. 2006  
Lin Xingsun

Checked by: Smart Li, Date: Oct. 24. 2006  
Smart Li



Approved by: Wu Li An, Date: Oct. 24. 2006  
Wu Li An

## 2 General Information

### 2.1 Description of EUT

|                            |   |
|----------------------------|---|
| <b>Description:</b>        | GSM 850/900/1800/1900 GPRS Mobile Phone |
| <b>Model No.:</b>          | Peaen                                   |
| <b>Serial No.:</b>         | 10416080000001261                       |
| <b>Hardware Version:</b>   | P1                                      |
| <b>Software Version:</b>   | TF_WM5_PEAN_VER_01.02                   |
| <b>Modulation</b>          | OFDM                                    |
| <b>Frequency:</b>          | 2412MHz – 2462 MHz                      |
| <b>Number of Channels:</b> | 11                                      |
| <b>Rated Power:</b>        | 20dBm                                   |
| <b>Wi-Fi Antenna:</b>      | Permanent attached<br>Gain = -2.8 dBi   |

**NOTE:**

- The EUT is a GSM mobile phone. It provides Wi-Fi (IEEE 802.11g) wireless interface, operating at 2.4GHz ISM band. The Wi-Fi modulation is Orthogonal Frequency Division Multiplexing (OFDM). The Channels and transmitter center frequencies are:
  - Channel 1: 2412 MHz (lowest channel)
  - Channel 2: 2417 MHz
  - Channel 3: 2422 MHz
  - Channel 4: 2417 MHz
  - Channel 5: 2432 MHz
  - Channel 6: 2437 MHz (middle channel)
  - Channel 7: 2442 MHz
  - Channel 8: 2447 MHz
  - Channel 9: 2452 MHz
  - Channel 10: 2457 MHz
  - Channel 11: 2462 MHz (highest channel);
- Please refer to Appendix I for the photographs of the EUT. For a more detailed features description about the EUT, please refer to User's Manual.

### 2.2 Objective

Perform EMC test according to FCC Part 15 Subpart C (Wi-Fi, 2.4GHz ISM band radiator).

## 2.3 Test Standards and Results

The EUT has been tested according to 47 CFR Part 15, Radio Frequency Devices.

Test items and the results are as bellow:

| No | FCC Rules             | Test Type                   | Result | Test Date  |
|----|-----------------------|-----------------------------|--------|------------|
| 1  | §15.207               | Conducted Emission          | PASS   | 2006.10.21 |
| 2  | §15.209<br>§15.247(c) | Radiated Emission           | PASS   | 2006.10.22 |
| 3  | §15.247(a)            | 6dB Bandwidth               | PASS   | 2006.10.23 |
| 4  | §15.247(b)            | Maximum Peak Output Power   | PASS   | 2006.10.23 |
| 5  | §15.247(c)            | Band Edge                   | PASS   | 2006.10.23 |
| 6  | §15.247(c)            | Conducted Spurious Emission | PASS   | 2006.10.23 |
| 7  | §15.247(d)            | Power Spectrum Density      | PASS   | 2006.10.23 |

## 2.4 List of Test Equipments Used

| Description            | Manufacturer    | Model No.              | Cal. Due Date | Serial No.         |
|------------------------|-----------------|------------------------|---------------|--------------------|
| Test Receiver          | Rohde & Schwarz | ESIB26                 | 2007.06.05    | A0304218           |
| Test Receiver          | Schwarzbeck     | FCKL1528               | 2007.06.05    | A0304230           |
| LISN                   | Schwarzbeck     | NSLK8127               | 2007.06.05    | A0304233           |
| Loop Antenna           | Rohde & Schwarz | HFH2-Z2                | 2007.06.05    | A0304220           |
| Ultra Broadband Ant.   | Rohde & Schwarz | HL562                  | 2007.06.05    | A0304224           |
| Horn Ant.              | Rohde & Schwarz | HF906                  | 2007.06.05    | 100150             |
| Power Meter<br>(Probe) | Rohde & Schwarz | NRVS<br>(NRV5-Z2)      | 2007.06.10    | 100729<br>(100254) |
| Shield Room            | Nanbo Tech      | Site 1                 | 2007.01.17    | A0304188           |
| Anechoic Chamber       | Albatross       | EMC12.8×6.8×<br>6.4(m) | 2007.04.10    | A0304210           |

## 2.5 Test Facility

Shenzhen Electronic Product Quality Testing Center (SET) is a third party testing organization accredited by China National Accreditation Board for Laboratories (CNAL) according to ISO/IEC 17025. The accreditation certificate number is **L1659**.

The EMC chamber site No.1 (EMC12.8×6.8×6.4(m)), and the radiated and conducted Emission test equipments of SET are constructed and calibrated to meet the FCC requirements ANSI C63.4:2001 and CISPR 22/EN 55022. The FCC Registration Number is **261302**.

The EMC chamber site No.1 (EMC12.8×6.8×6.4(m)) also complies with Canada standard RSS 212, and acceptable to Industry Canada for the performance of radiated measurements. The Industry Canada Registration Number is **IC 5915**.

## 2.6 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

### 3 Conducted Emission Test

#### 3.1 Limits of Conducted Emission

According to FCC §15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN).

| Frequency range<br>(MHz) | Conducted Limit (dB $\mu$ V) |          |
|--------------------------|------------------------------|----------|
|                          | Quasi-peak                   | Average  |
| 0.15 - 0.50              | 66 to 56                     | 56 to 46 |
| 0.50 - 5                 | 56                           | 46       |
| 0.50 - 30                | 60                           | 50       |

**NOTE:**

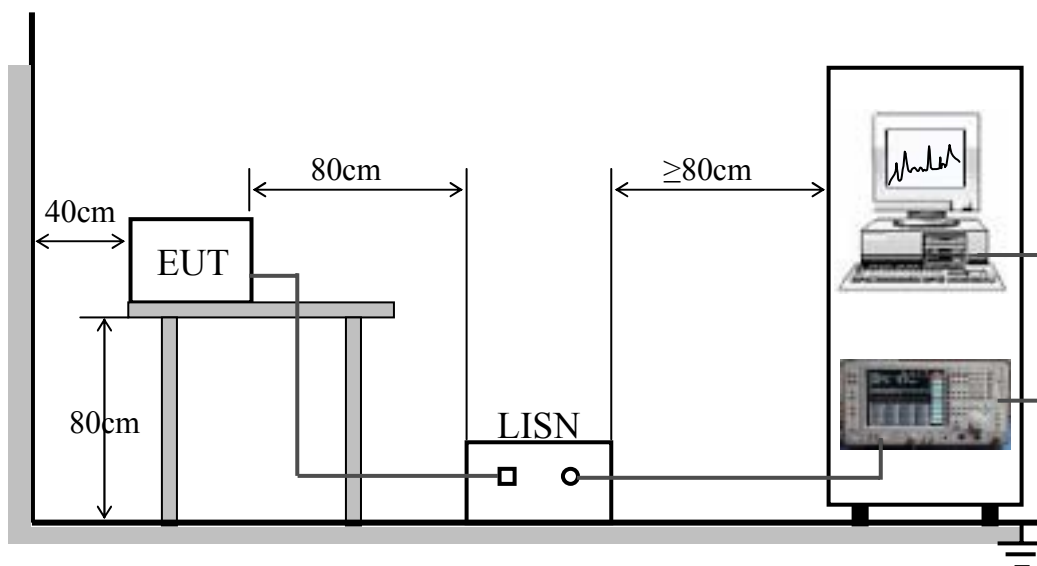
1. The lower limit shall apply at the band edges.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

#### 3.2 Test Procedure

- a. The EUT was placed on a 0.8m high insulating table and kept 0.4 meters from the conducting wall of shielded room.
- b. The EUT was connected to the power mains through a line impedance stabilization network (LISN). The LISN provide 50 $\Omega$ /50 $\mu$ H of coupling impedance for the measuring instrument.
- c. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- d. The frequency range from 150 kHz to 30 MHz was searched using CISPR Quasi-Peak and Average detector.



### 3.3 Test Setup



For the actual test configuration, please refer to the related item - Photographs of the Test Configuration.

### 3.4 EUT Setup and Operating Conditions

The EUT configuration of the emission tests was MS + Battery + Charger.

During the measurement, the EUT was charging empty battery. The charger was powered by 120V 60Hz AC mains supply.

The Wi-Fi function of the MS was activated. The EUT accessed to the internet through a Wi-Fi wireless router (D-LINK, DI-624+A), and kept transceiving data with a network termination.

### 3.5 Test Results

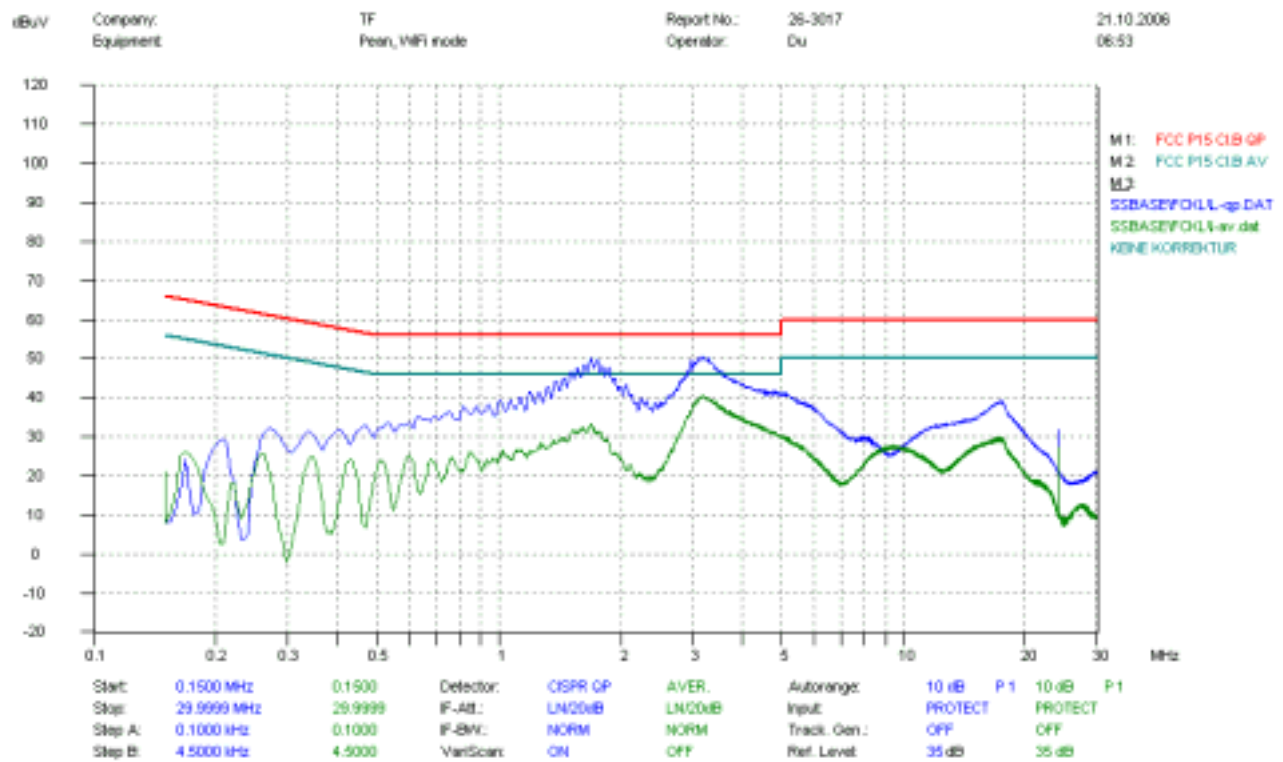
| No. | Freq. (MHz) | Limit Value (dB $\mu$ V) |      | Emission Level (dB $\mu$ V) |      |
|-----|-------------|--------------------------|------|-----------------------------|------|
|     |             | QP                       | AV   | QP                          | AV   |
| 1   | 1.0055      | 56.0                     | 46.0 | 39.4                        | 26.2 |
| 2   | 1.6910      | 56.0                     | 46.0 | 50.0                        | 33.1 |
| 3   | 3.1850      | 56.0                     | 46.0 | 50.5                        | 40.2 |
| 4   | 4.8200      | 56.0                     | 46.0 | 41.9                        | 31.6 |
| 5   | 17.4000     | 60.0                     | 50.0 | 39.0                        | 29.8 |

**NOTE:**

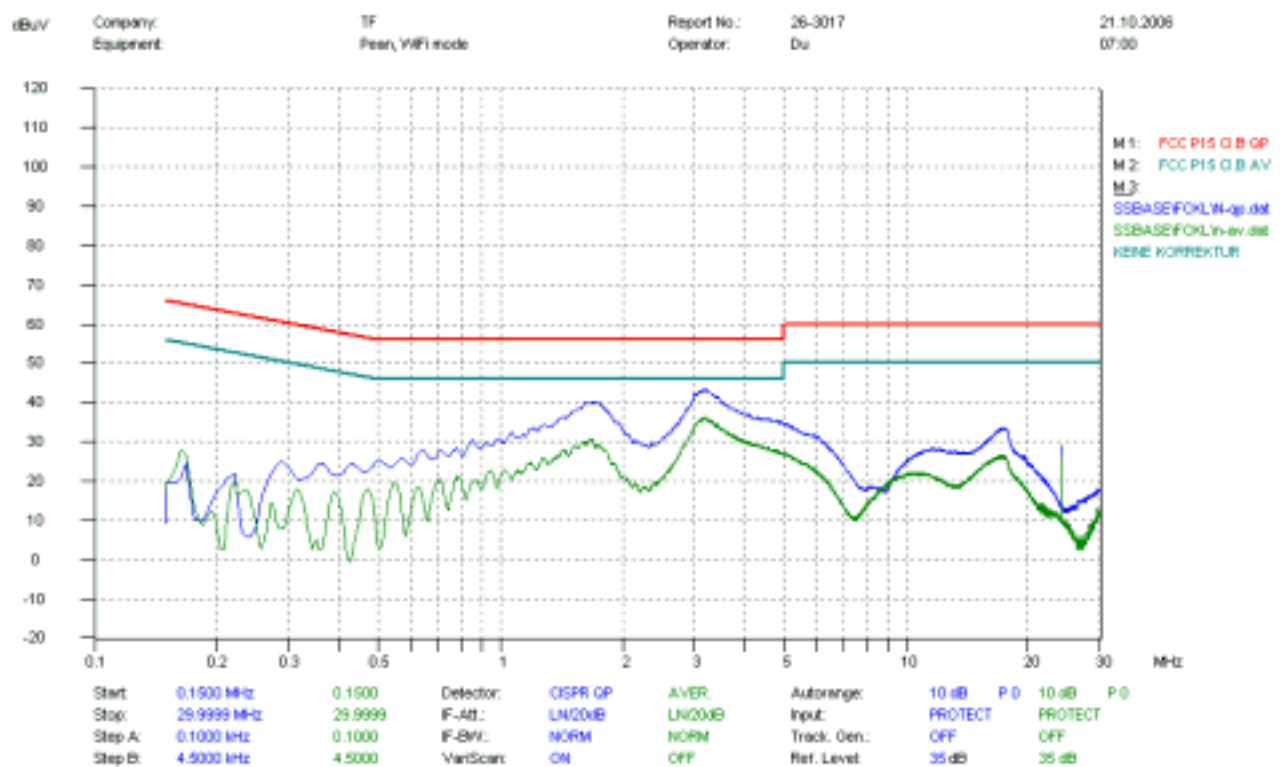
1. QP and AV are abbreviations of the quasi-peak and average individually.
2. If the emission levels measured with QP detector are lower than AV limits, there is unnecessary to measure with AV detector.
3. The emission levels recorded above is the larger ones of both L phase and N phase.

## Test Plots

### 1. Mains terminal disturbance voltage, L phase



### 2. Mains terminal disturbance voltage, N phase



## 4 Radiated Emission Test

### 4.1 Limits of Radiated Emission

According to FCC §15.247(c), radiated emission outside the frequency band attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

According to FCC §15.209 (a), Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency(MHz) | Field Strength( $\mu$ V/m) | Measurement Distance(m) |
|----------------|----------------------------|-------------------------|
| 0.009 - 0.490  | 2400/F(kHz)                | 300                     |
| 0.490 - 1.705  | 24000/F(kHz)               | 30                      |
| 1.705 - 30.0   | 30                         | 30                      |
| 30 - 88        | 100                        | 3                       |
| 88 - 216       | 150                        | 3                       |
| 216 - 960      | 200                        | 3                       |
| Above 960      | 500                        | 3                       |

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules,

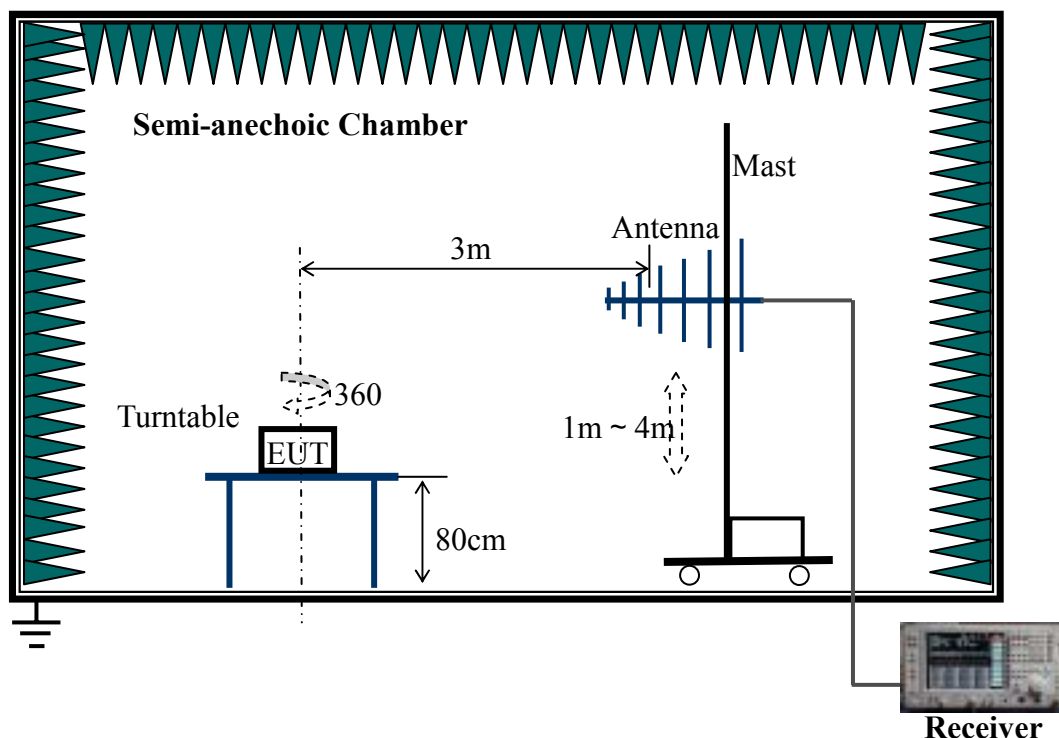
### 4.2 Test Procedure

- The EUT was placed on the top of a ratable 0.8 meters above the ground at a semi-anechoic chamber.
- In the frequency range of 9 kHz to 30 MHz, magnetic field was measured with loop antenna. The antenna was positioned with its plane vertical at 1 m distance from the EUT. The center of the loop was 1 m above the ground. During the measurement the loop antenna rotated about its vertical axis for maximum response at each azimuth about the EUT.
- In the frequency range above 30MHz, ultra-broadband bi-log antenna (30 MHz to 1 GHz) and horn antenna (above 1GHz) were used. Antenna was 3 meters away from the EUT. Antenna height was varied from one meter to four meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The test-receiver system was set to Peak Detector Function and Specified Bandwidth with

Maximum Hold Mode.

- e. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emission that did not have 10 dB margins would be retested one by one using the quasi-peak method.

### 4.3 Test Setup



For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

### 4.4 EUT Setup and Operating Conditions

Controlled by an embedded Wi-Fi test program provided by the applicant, the EUT was set to continuous Wi-Fi transmitting at maximum power and maximum data rate (72Mbps). Lowest, middle and highest channels were measured respectively.

### 4.5 Test Results

#### I. Fundamental Emissions

| EUT Operating Freq.<br>(MHz) | Antenna Polarization | Emission Level (dB $\mu$ V/m) |       |
|------------------------------|----------------------|-------------------------------|-------|
|                              |                      | PK                            | AV    |
| 2412.00                      | Vertical             | 92.66                         | 83.17 |
|                              | Horizontal           | 94.07                         | 83.66 |

|         |            |       |       |
|---------|------------|-------|-------|
| 2437.00 | Vertical   | 93.61 | 83.69 |
|         | Horizontal | 92.37 | 83.03 |
| 2462.00 | Vertical   | 95.43 | 84.54 |
|         | Horizontal | 91.09 | 82.97 |

**NOTE:** Field strength of fundamental emissions were measured and record as a reference for calculation of the band edge emissions according to Marker-Delta Method DA 00-705. See chapter 11.5.

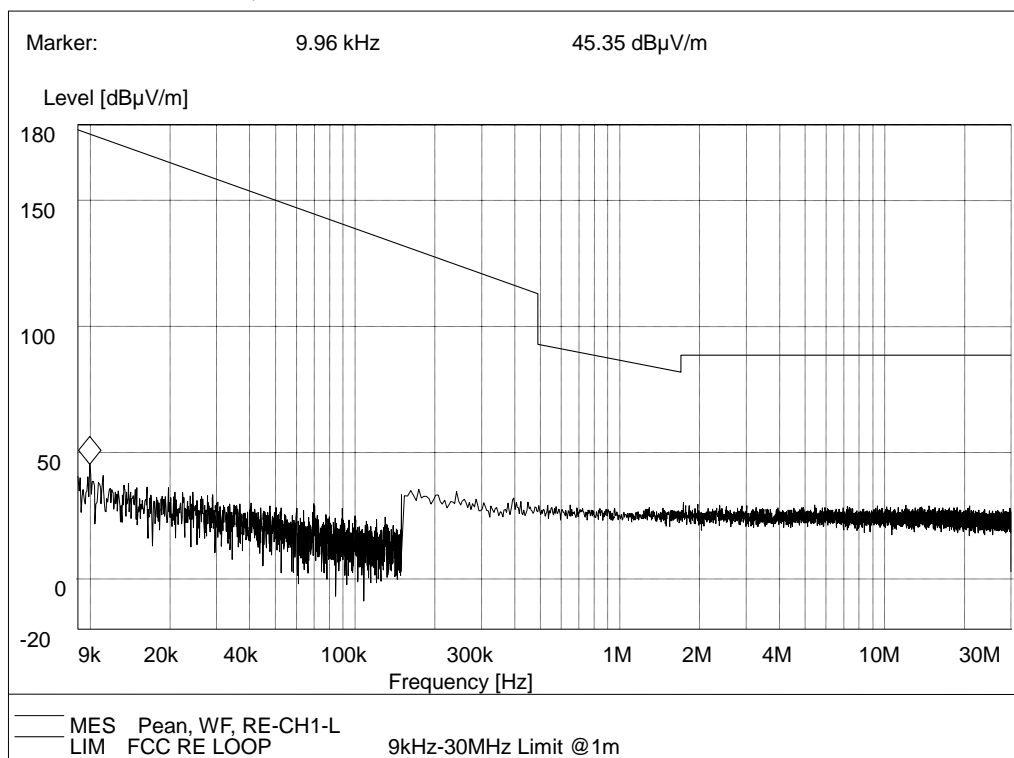
## II. Spurious Emissions

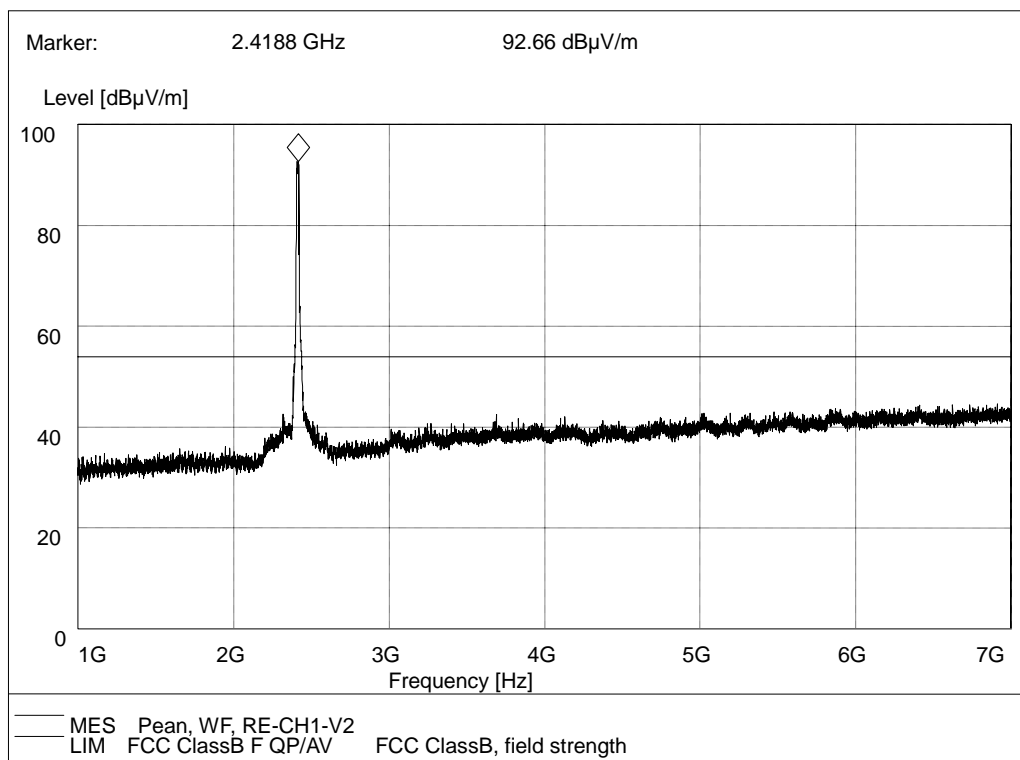
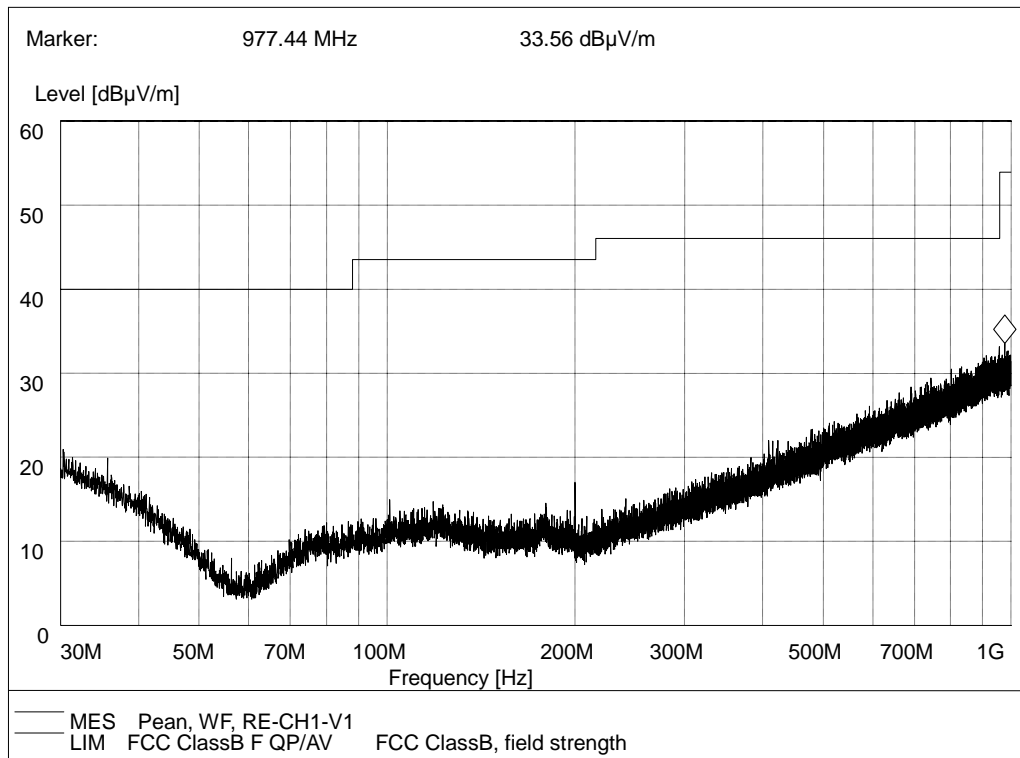
| EUT Operating Freq. (MHz) | Emissions Falling in Restrict Bands (MHz) | Antenna Polarization | Emission Level (dB $\mu$ V/m) |    | QP Limits (dB $\mu$ V/m) |    |
|---------------------------|---|----------------------|-------------------------------|----|--------------------------|----|
|                           |   |                      | PK                            | AV | PK                       | AV |
| 2412.00                   | No peak found                             | Vertical             | --                            | -- | 74                       | 54 |
|                           | No peak found                             | Horizontal           | --                            | -- | 74                       | 54 |
| 2437.00                   | No peak found                             | Vertical             | --                            | -- | 74                       | 54 |
|                           | No peak found                             | Horizontal           | --                            | -- | 74                       | 54 |
| 2462.00                   | No peak found                             | Vertical             | --                            | -- | 74                       | 54 |
|                           | No peak found                             | Horizontal           | --                            | -- | 74                       | 54 |

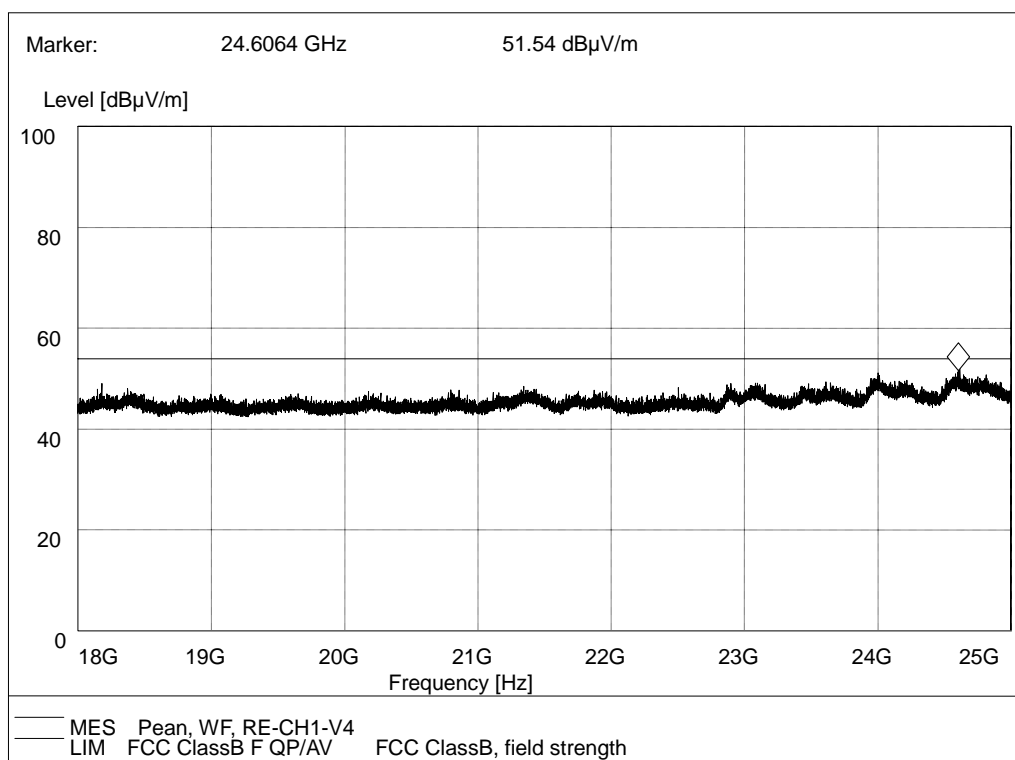
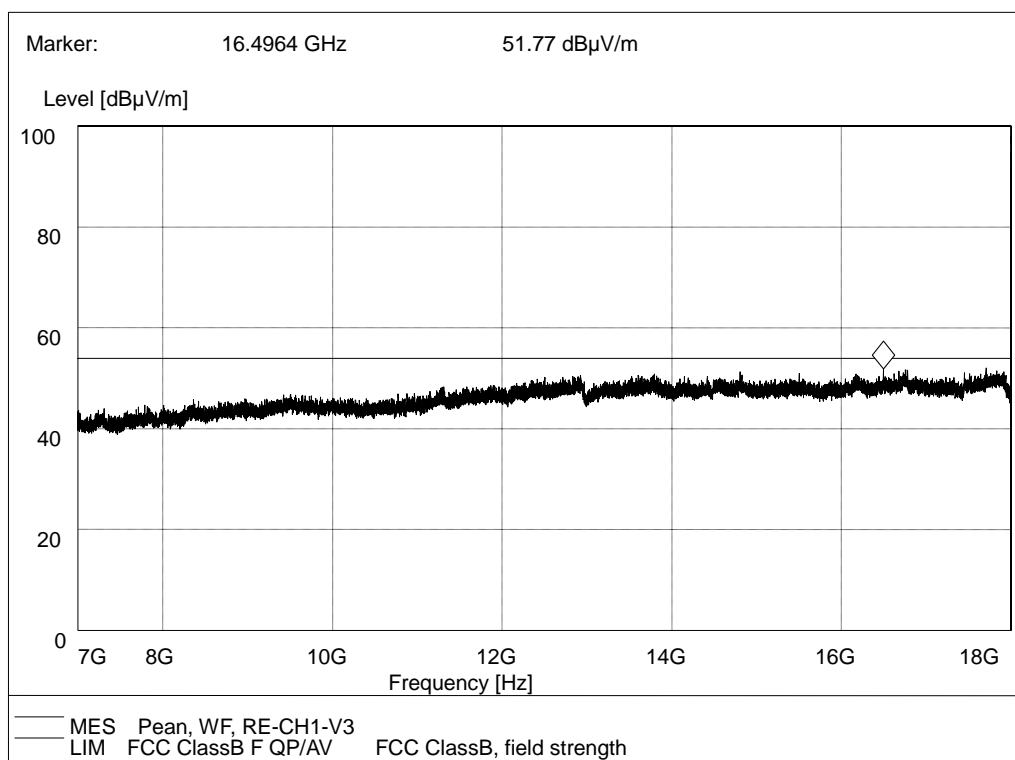
**NOTE:** The spurious Emissions from 9 kHz to 10th harmonic of the fundamental frequency were researched. Refer to following test plots.

### Test Plots

#### 1. Lowest channel 2412MHz, Vertical

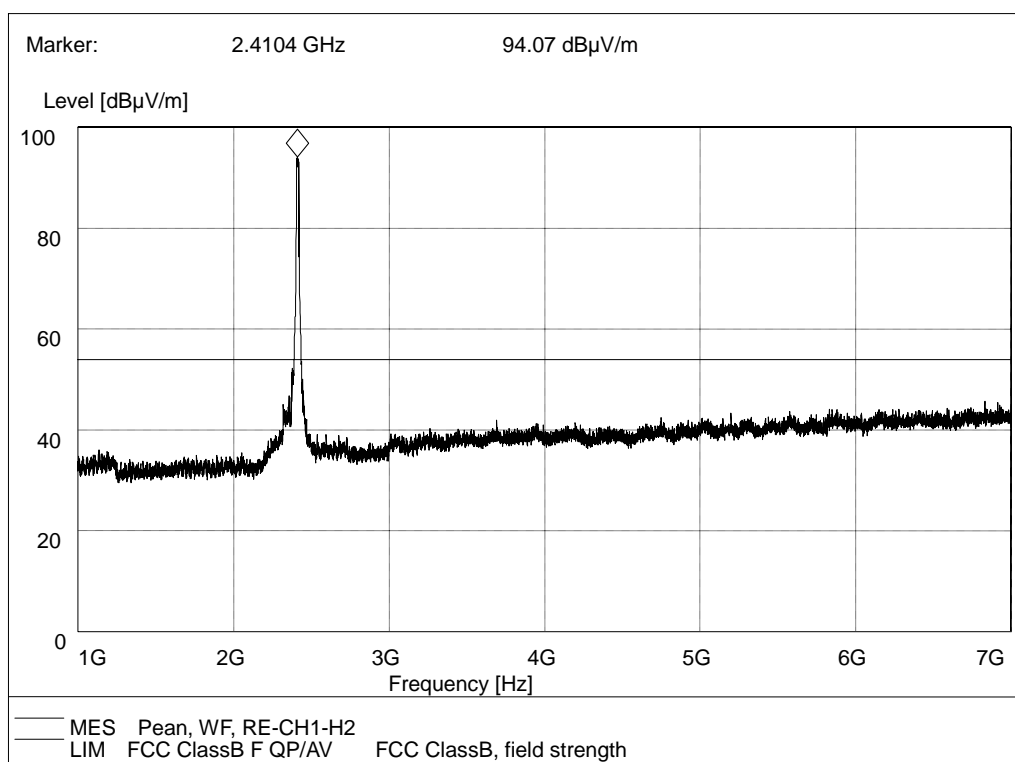
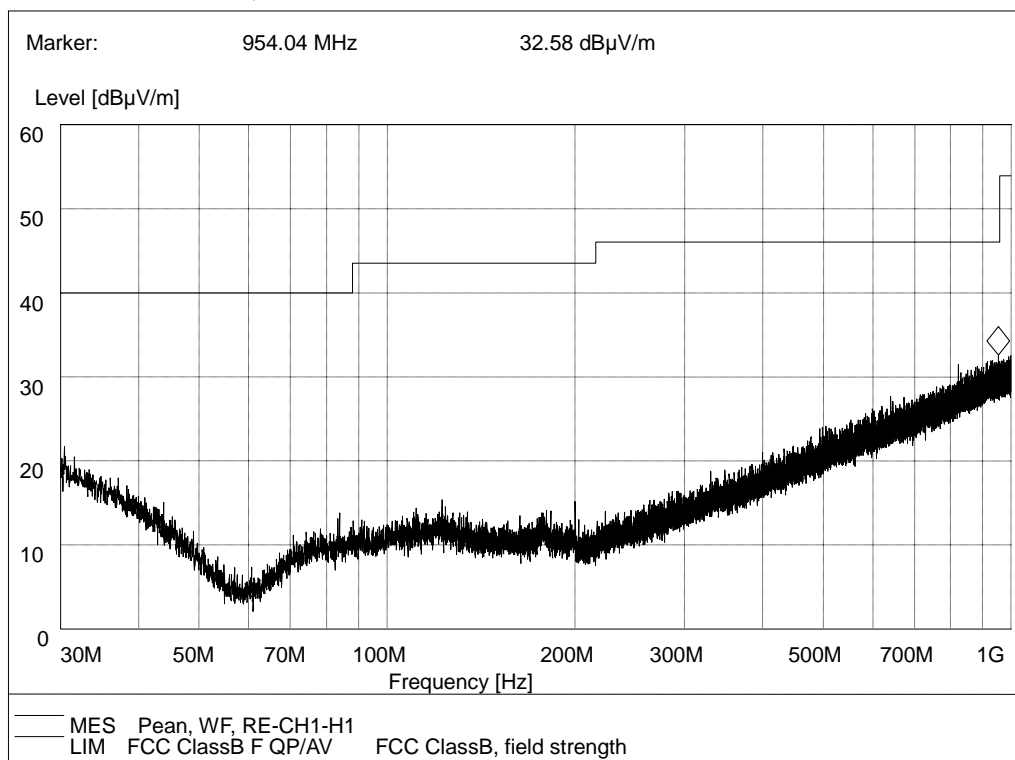


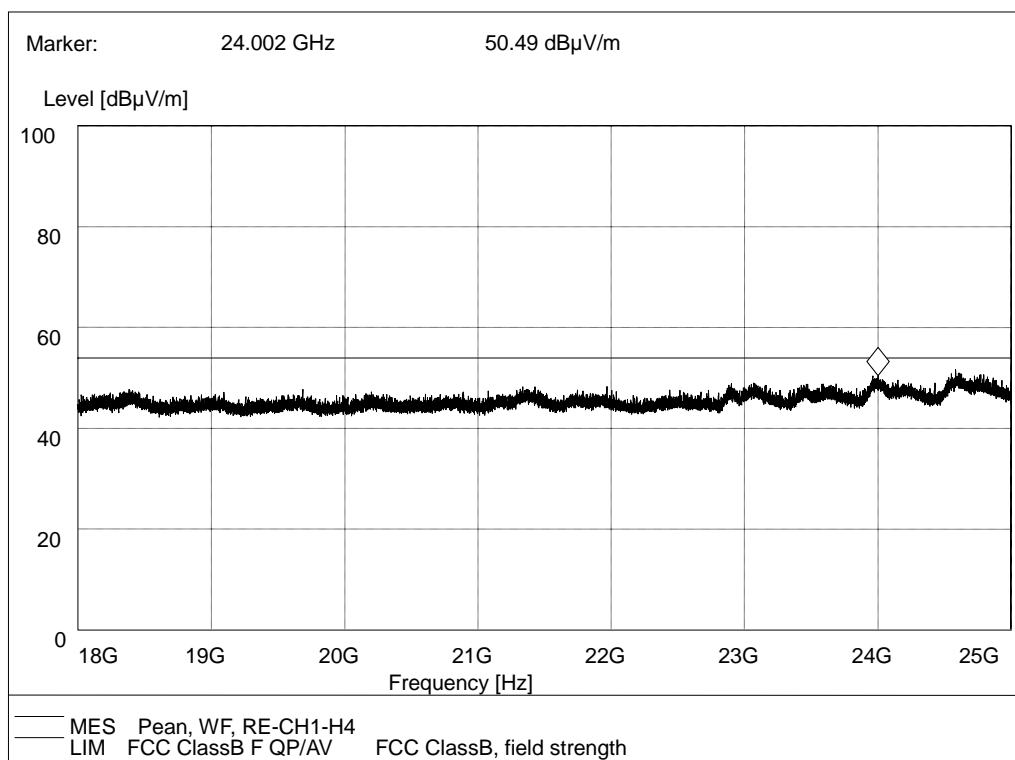
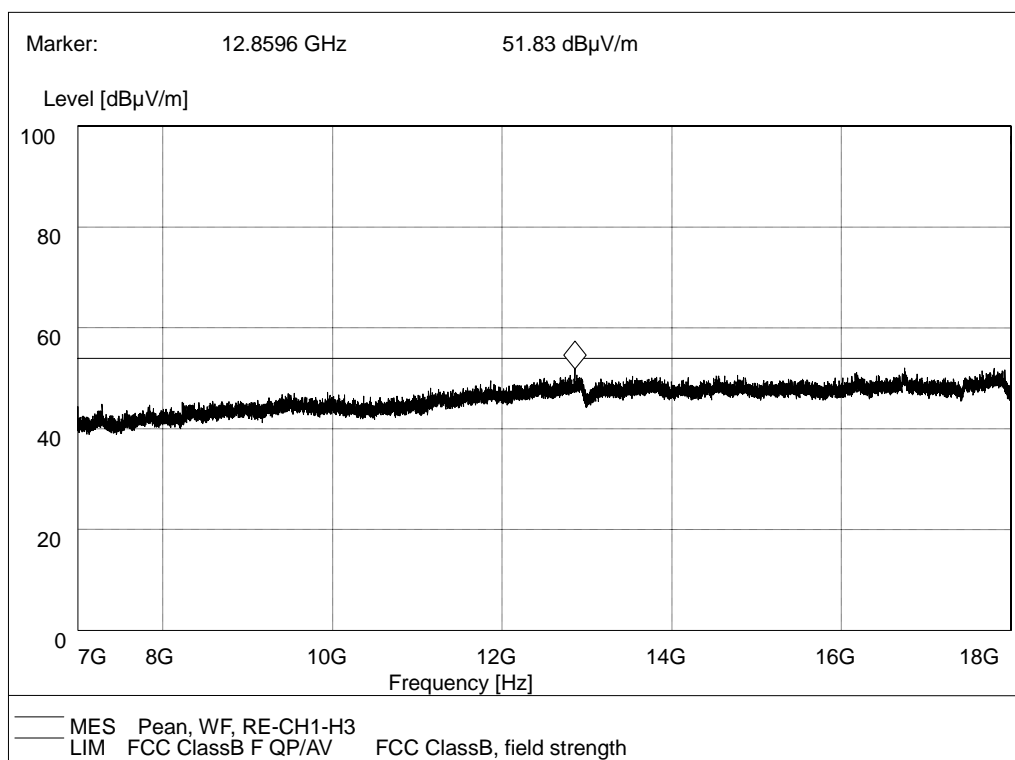




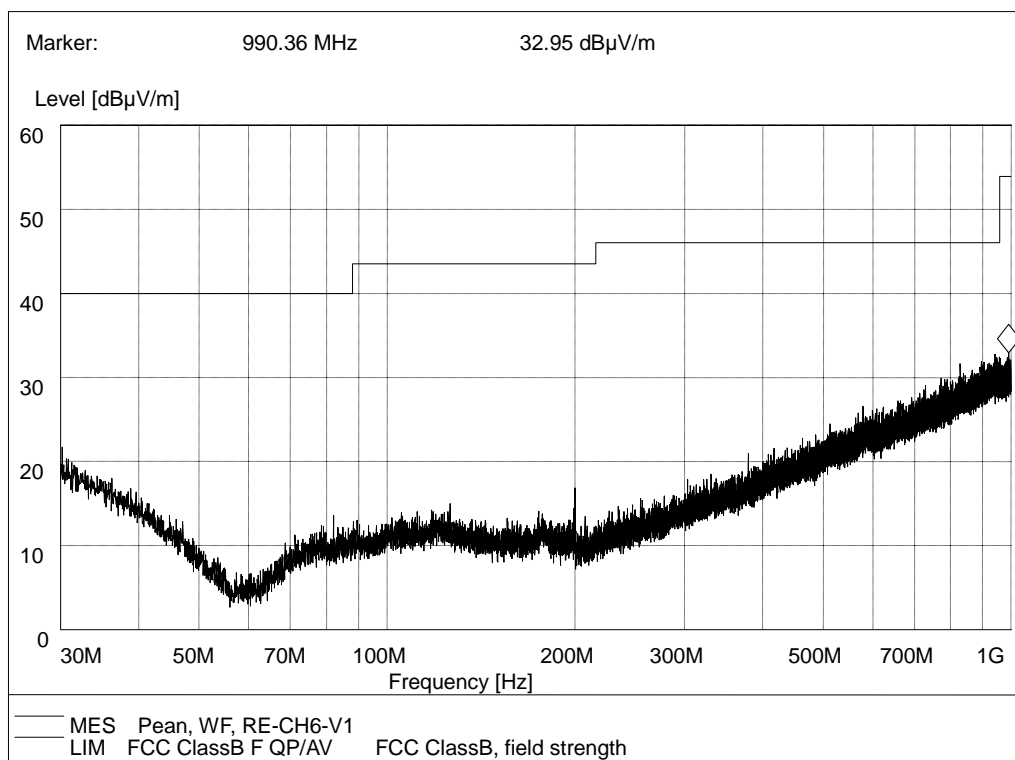
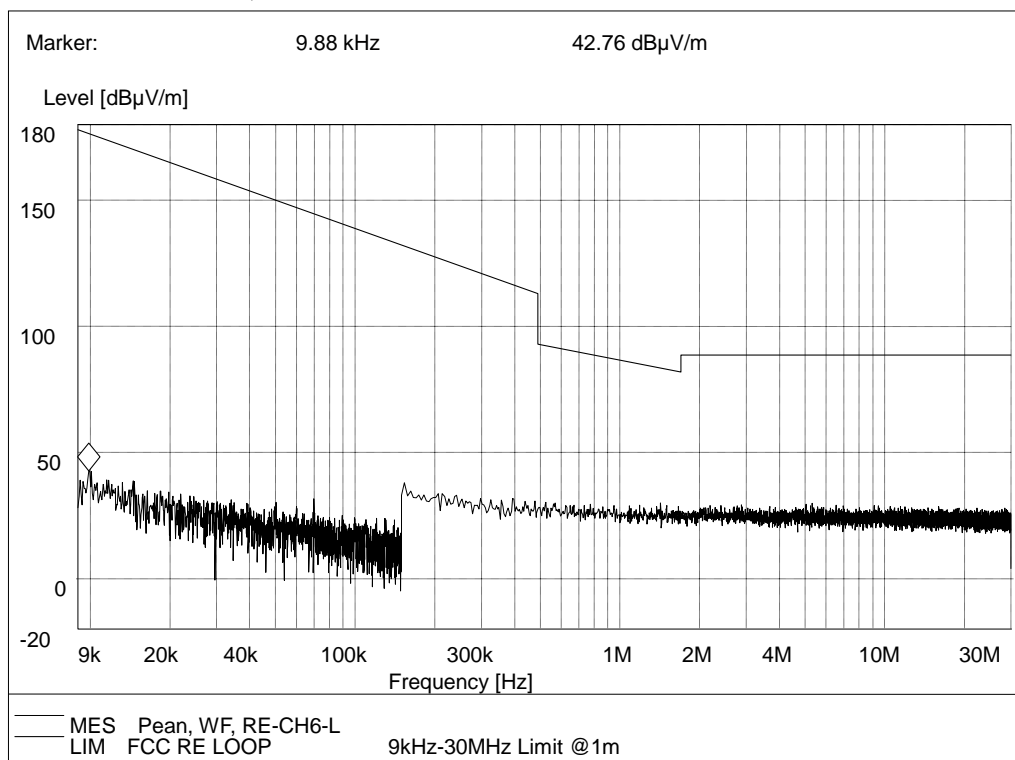


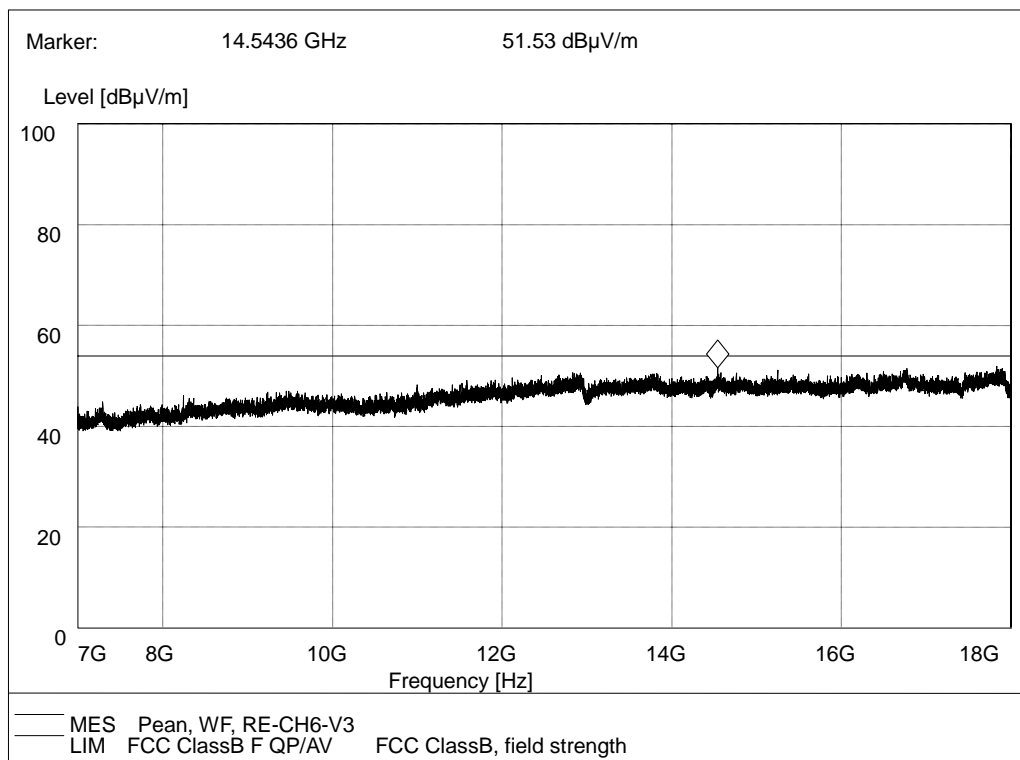
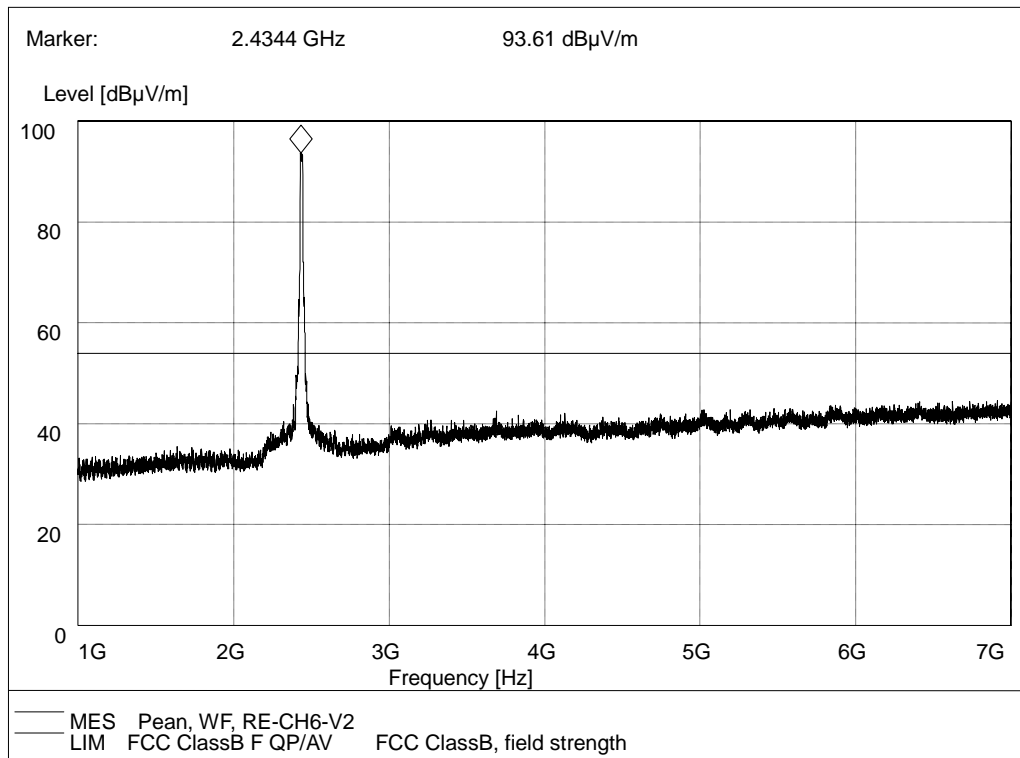
## 2. Lowest channel 2412MHz, Horizontal

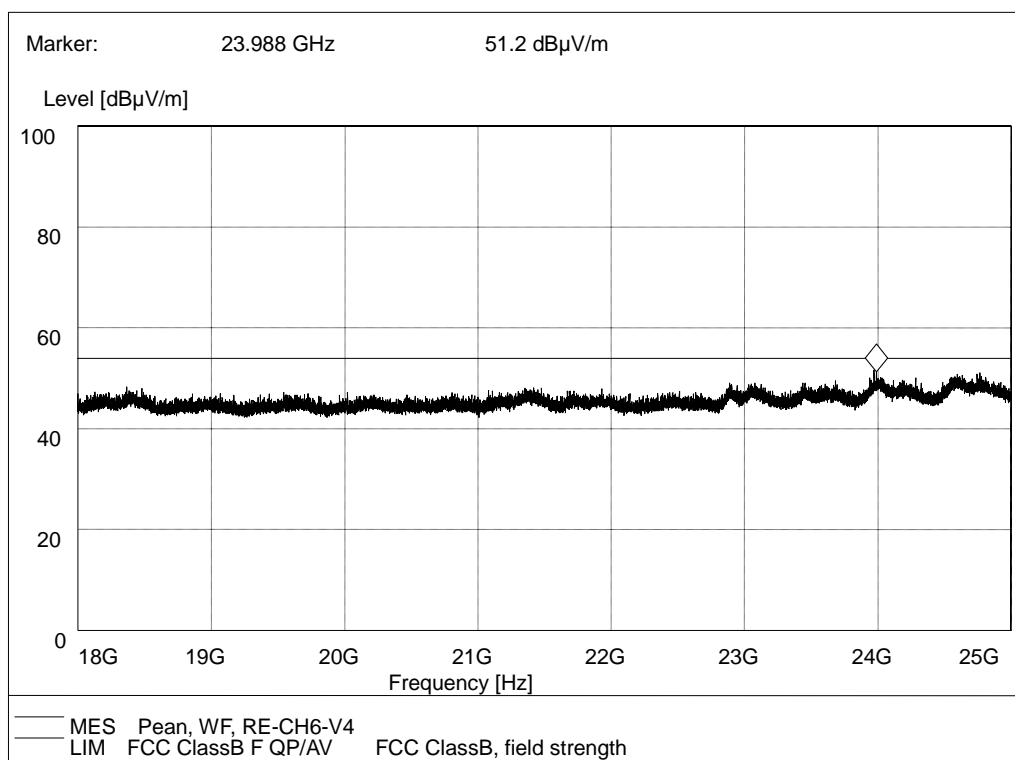




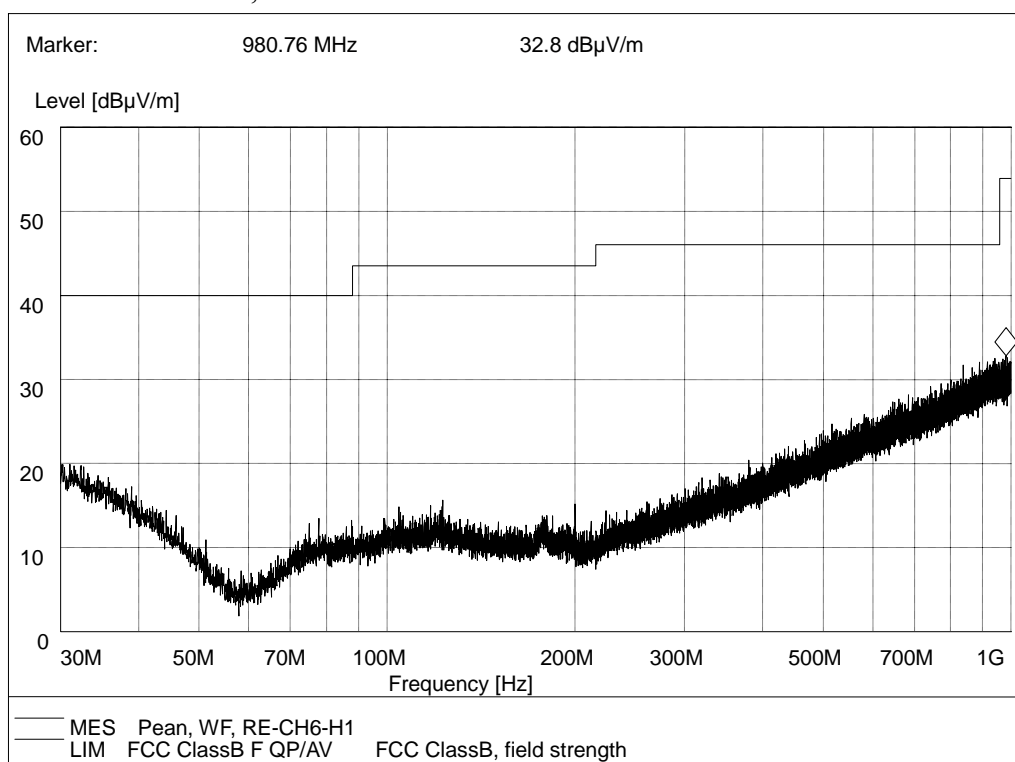
## 3. Middle channel 2437MHz, Vertical

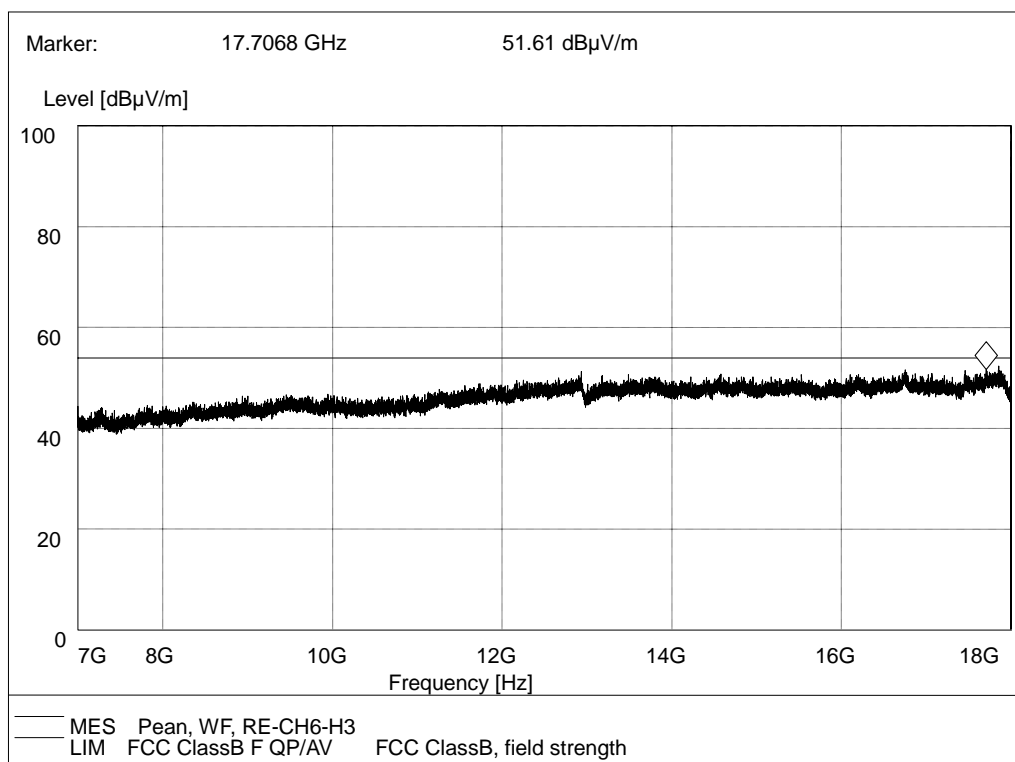
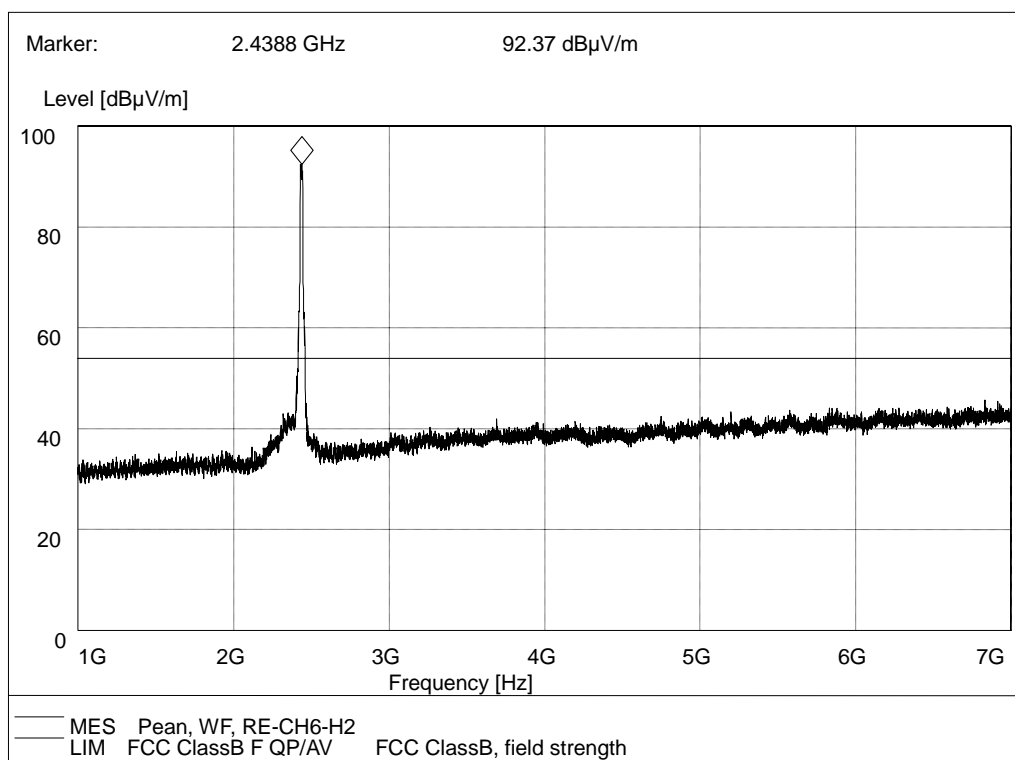


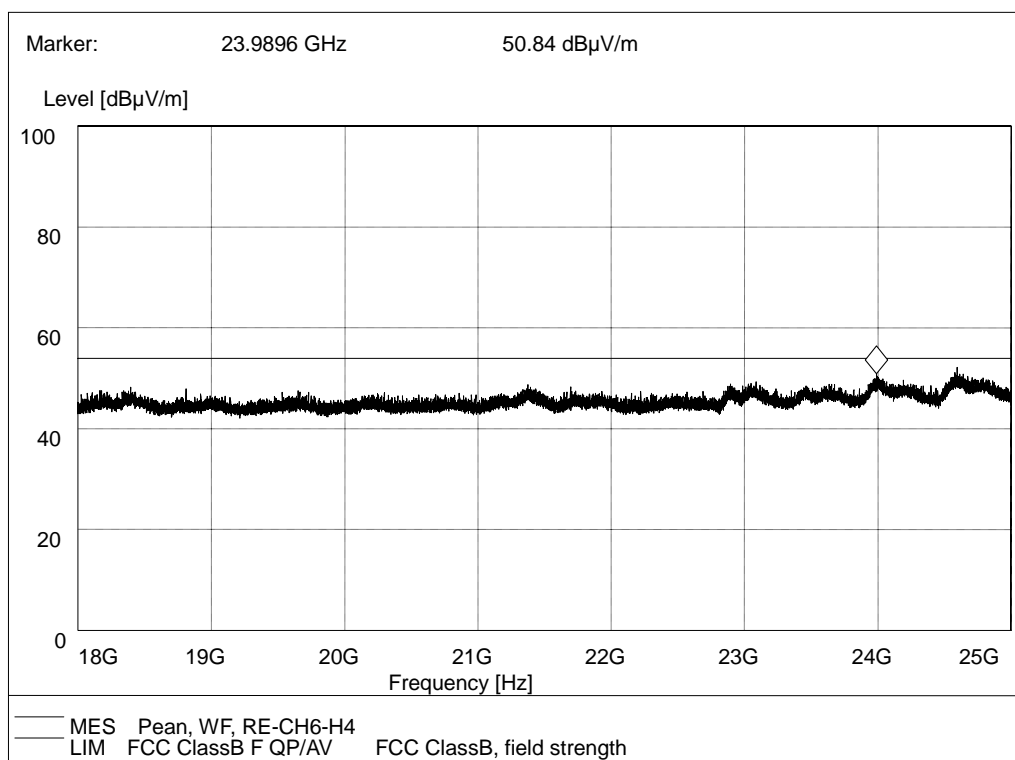




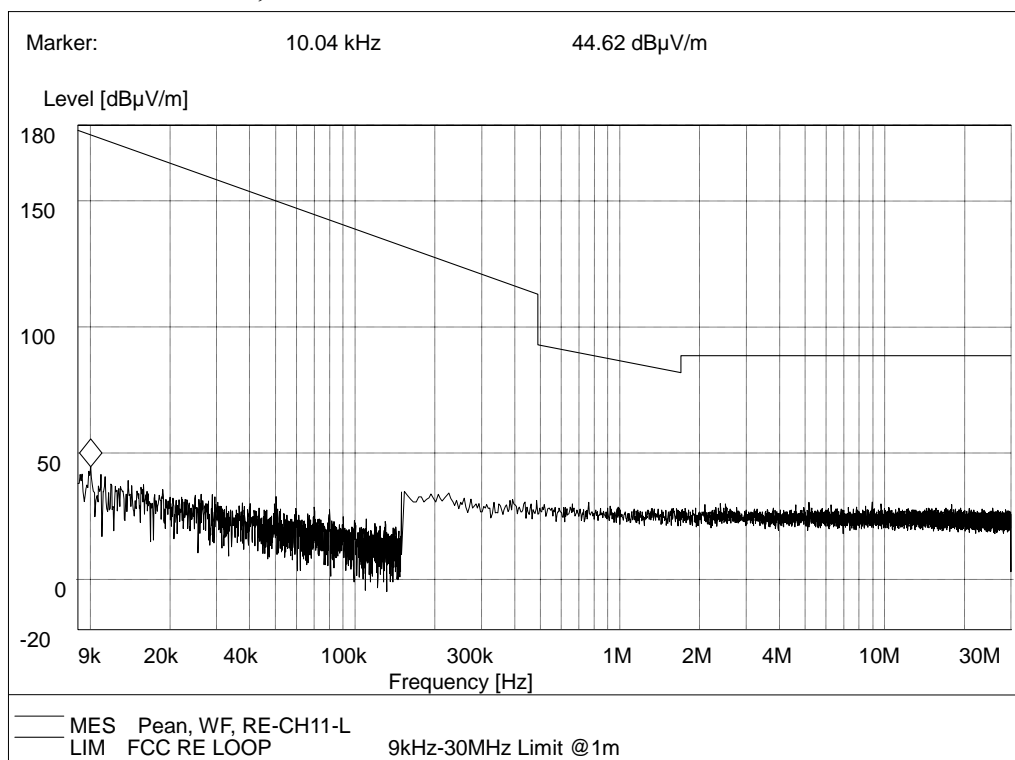
#### 4. Middle channel 2437MHz, Horizontal

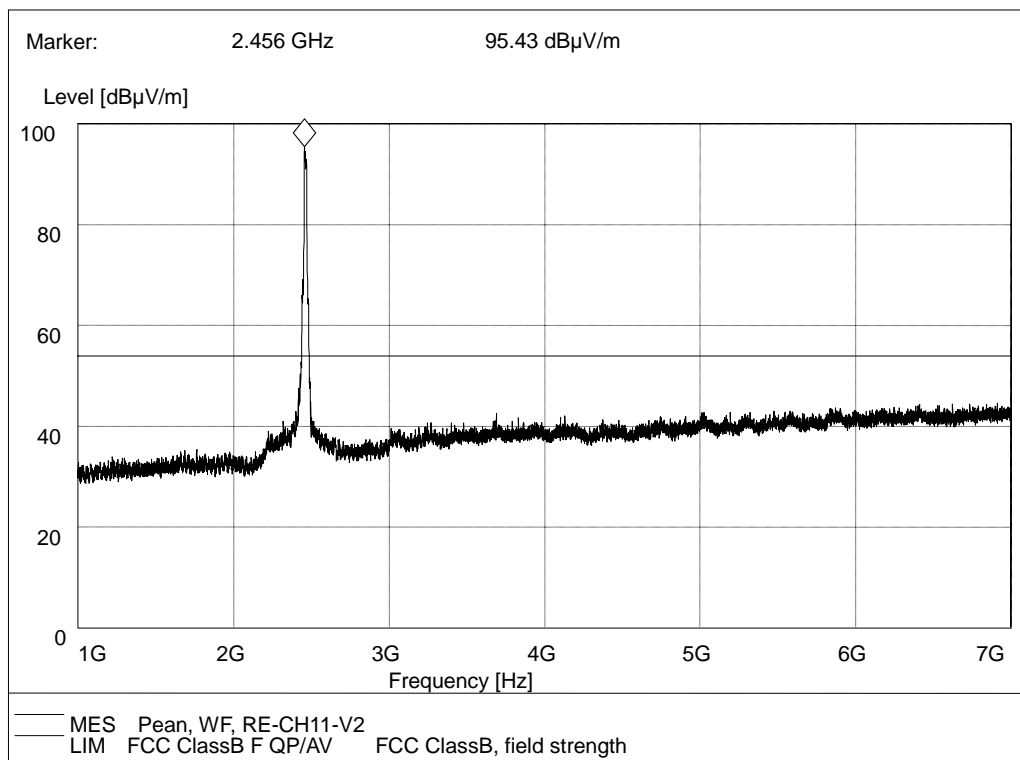
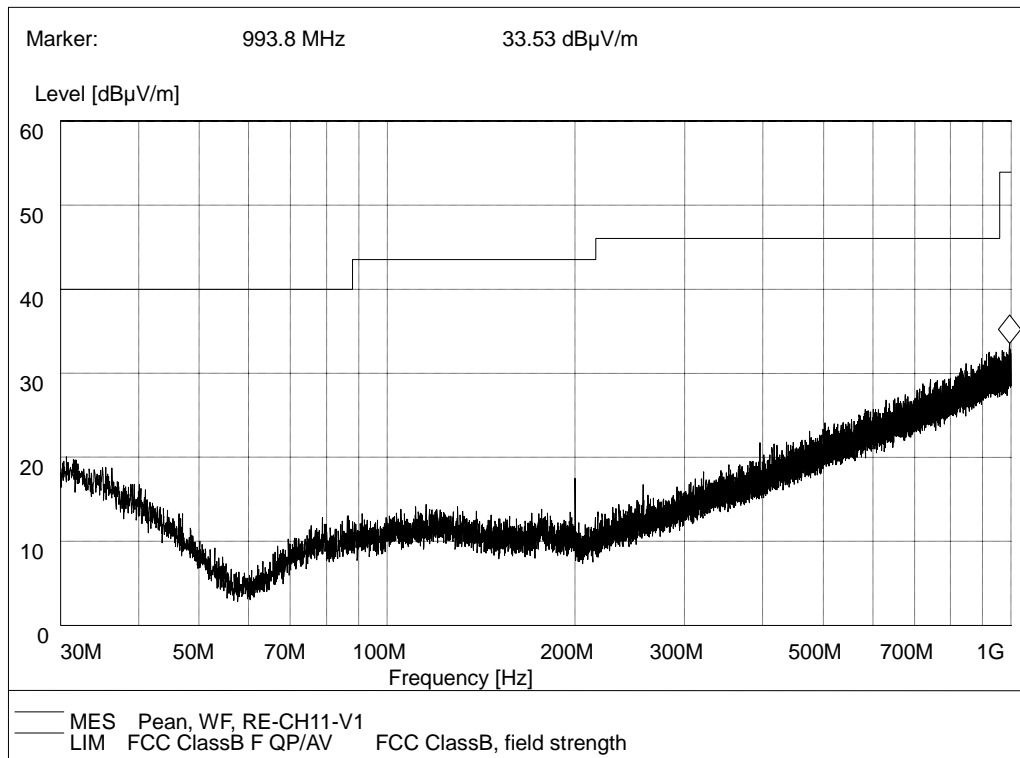




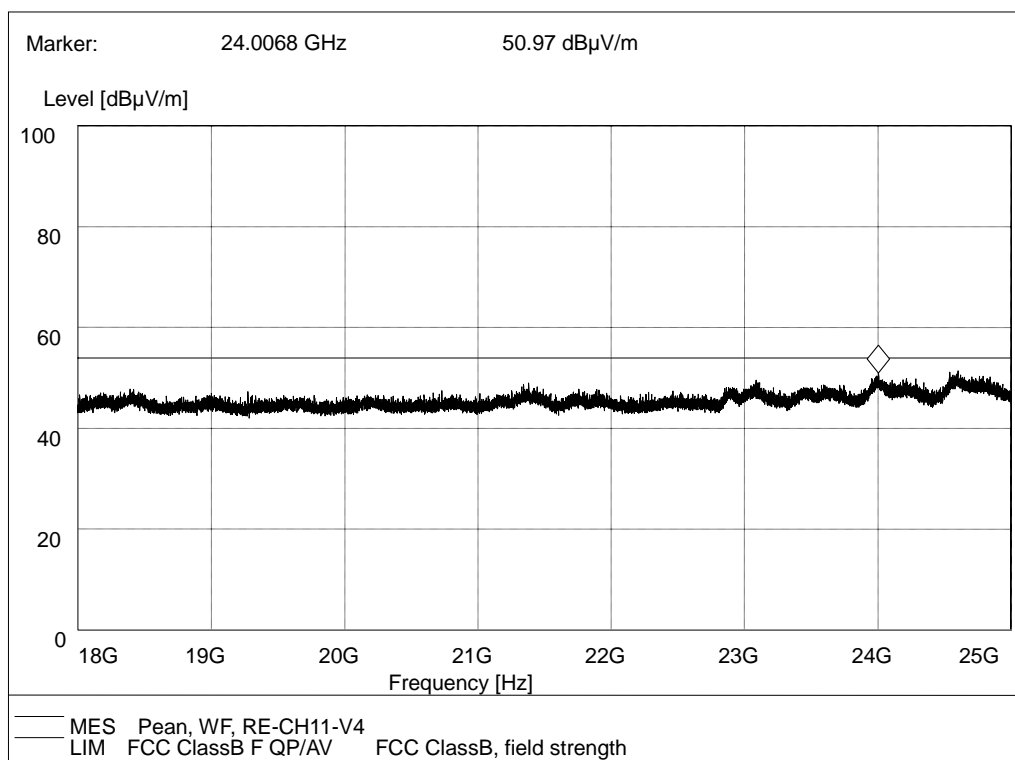
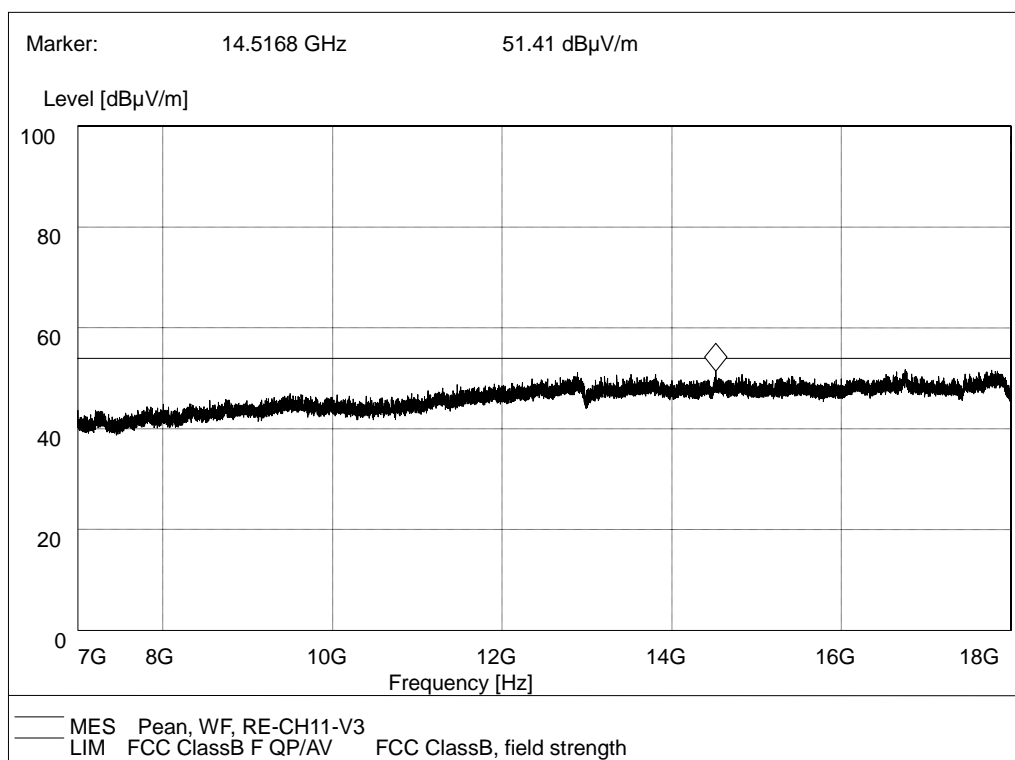


### 5. Highest channel 2462MHz, Vertical

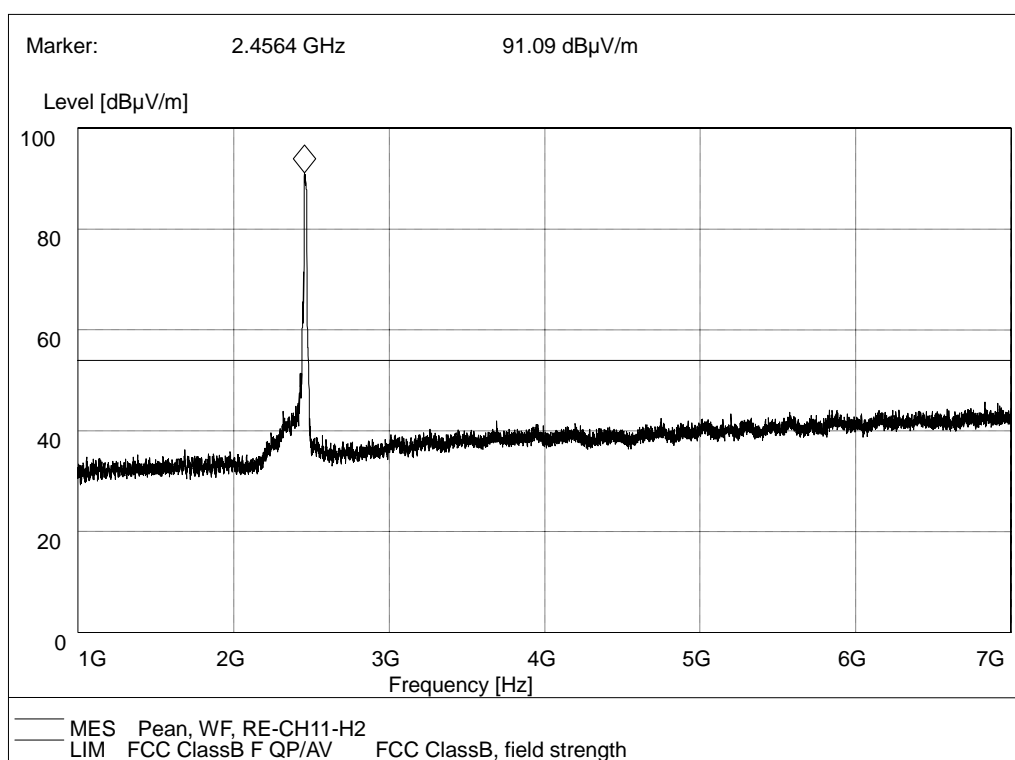
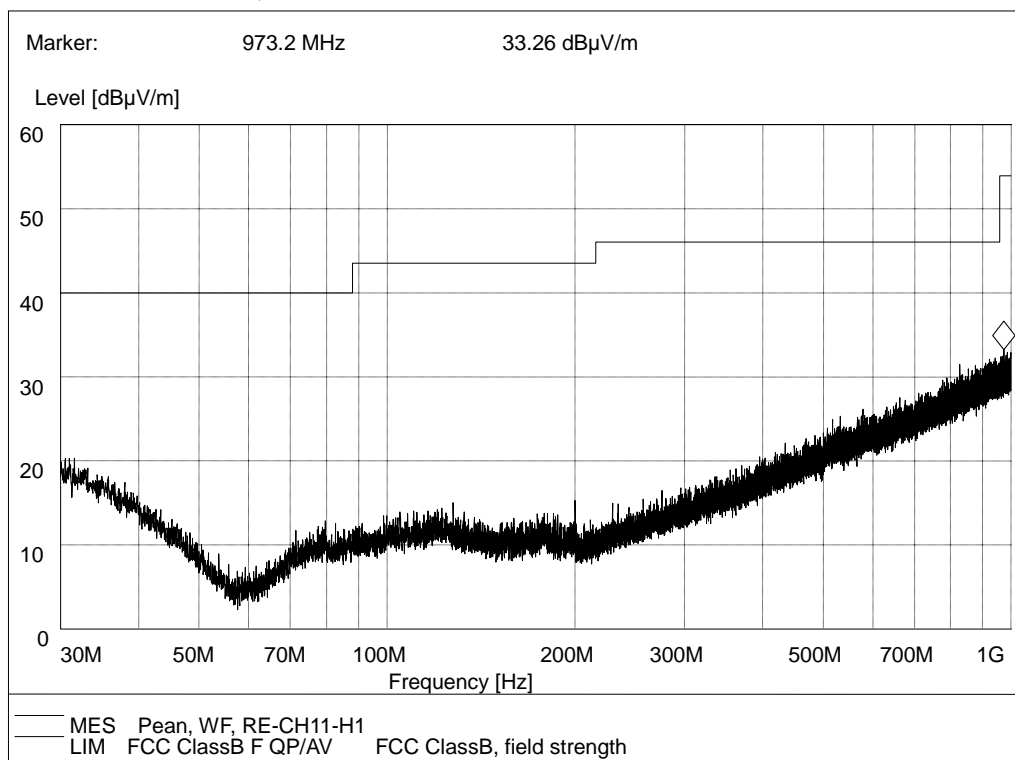


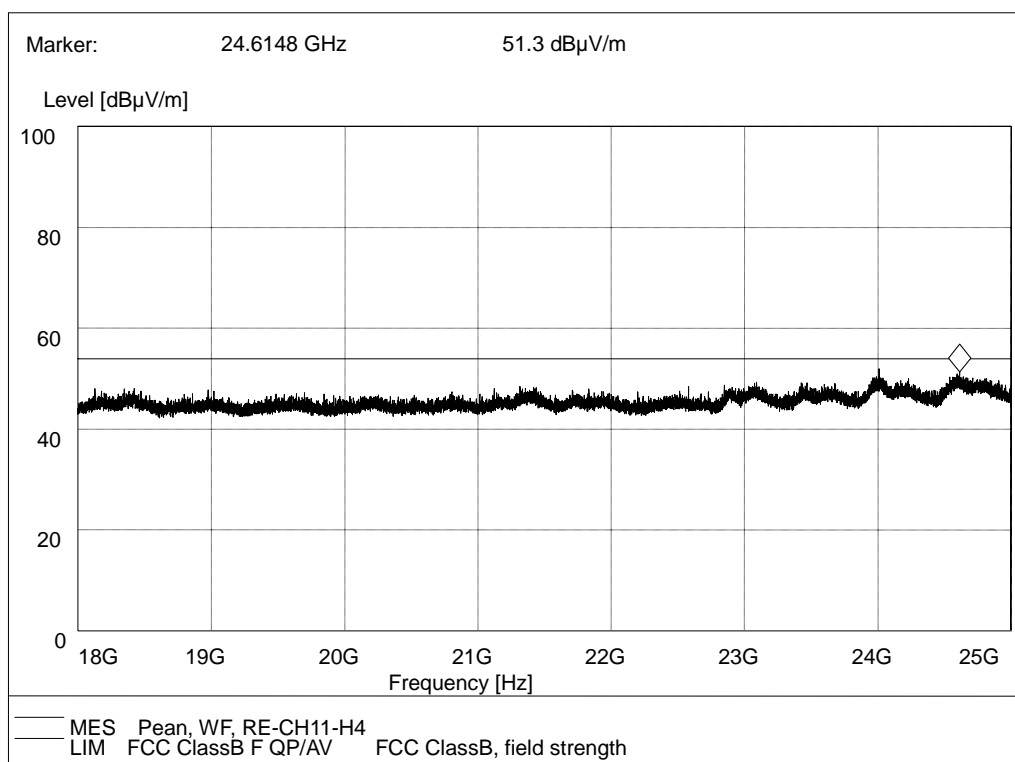
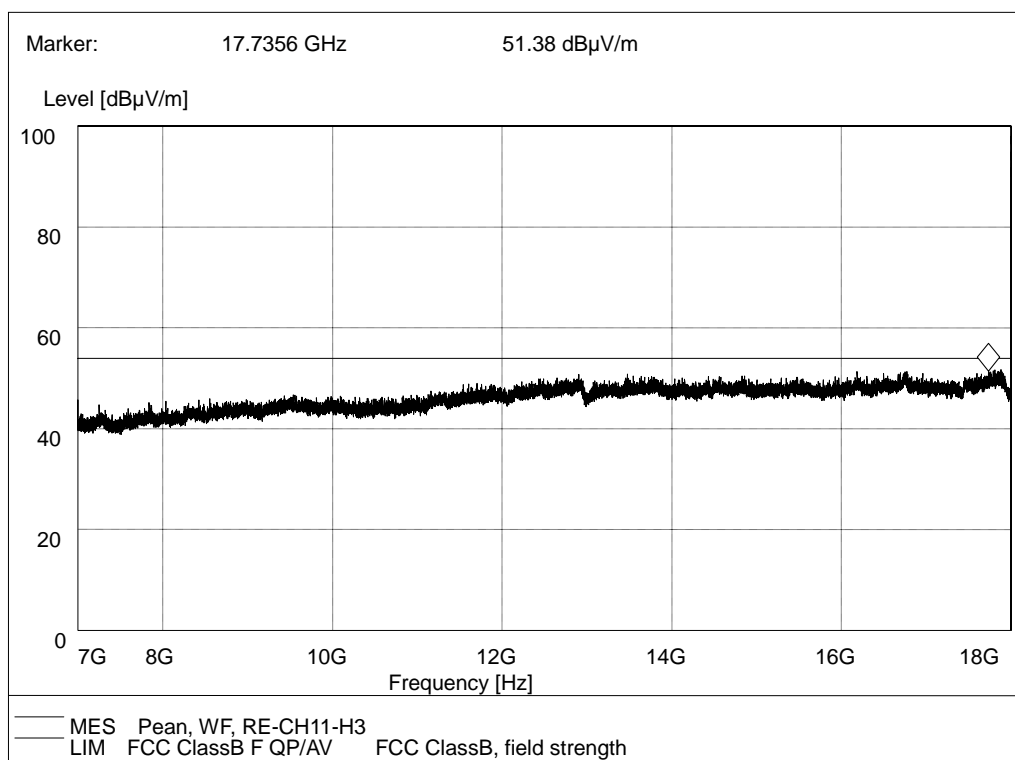






## 6. Highest channel 2462MHz, Horizontal





## 5 6dB Bandwidth Measurement

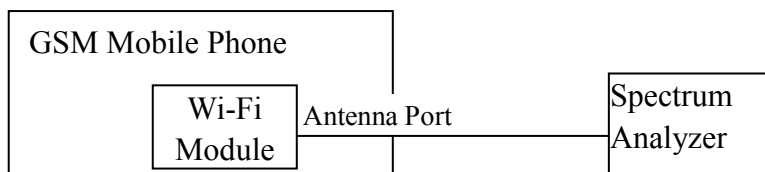
### 5.1 Definition

According to FCC §15.247 (a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 5.2 Test Procedure

- The EUT temporary antenna port was coupled to the spectrum analyzer. The loss of the cables the test system is calibrated to correct the reading.
- The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.
- The resolution bandwidth of the spectrum analyzer was set to at least 1% of the EUT emission bandwidth. RBW=100 kHz, VBW=300 kHz.

### 5.3 Test Setup



For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

### 5.4 EUT Setup and Operating Conditions

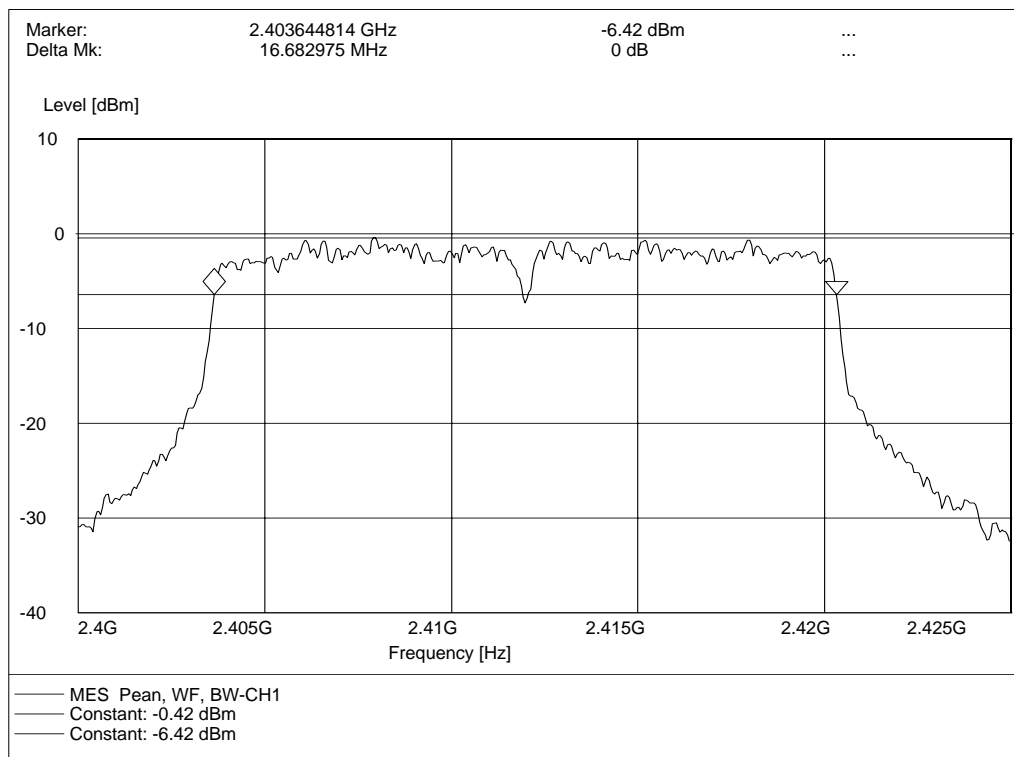
Control by an embedded Wi-Fi test program provided by the applicant, the EUT was set to continuous Wi-Fi transmitting at maximum power and maximum data rate (72Mbps). Lowest, middle and highest channels were measured respectively.

### 5.5 Test Results

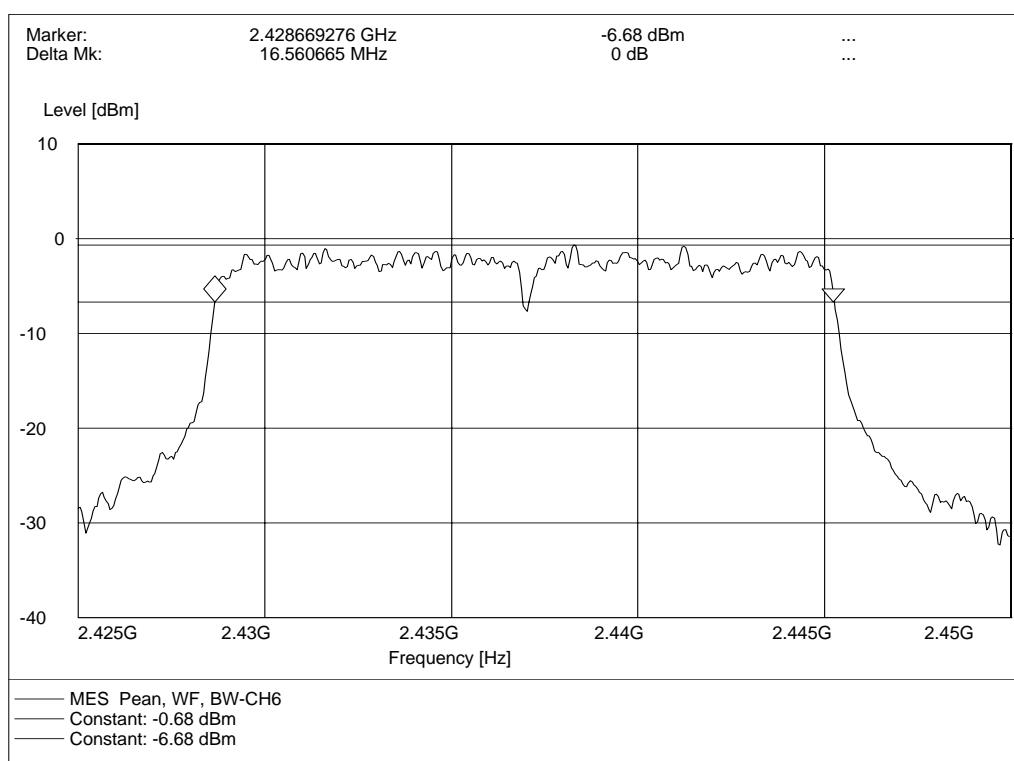
| Operating Frequency ( MHz ) | 6dB Bandwidth(MHz) | FCC Requirement |
|-----------------------------|--------------------|-----------------|
| 2412                        | 16.7               | >500 kHz        |
| 2437                        | 16.6               |                 |
| 2462                        | 16.6               |                 |

## 6dB Bandwidth Test Plots

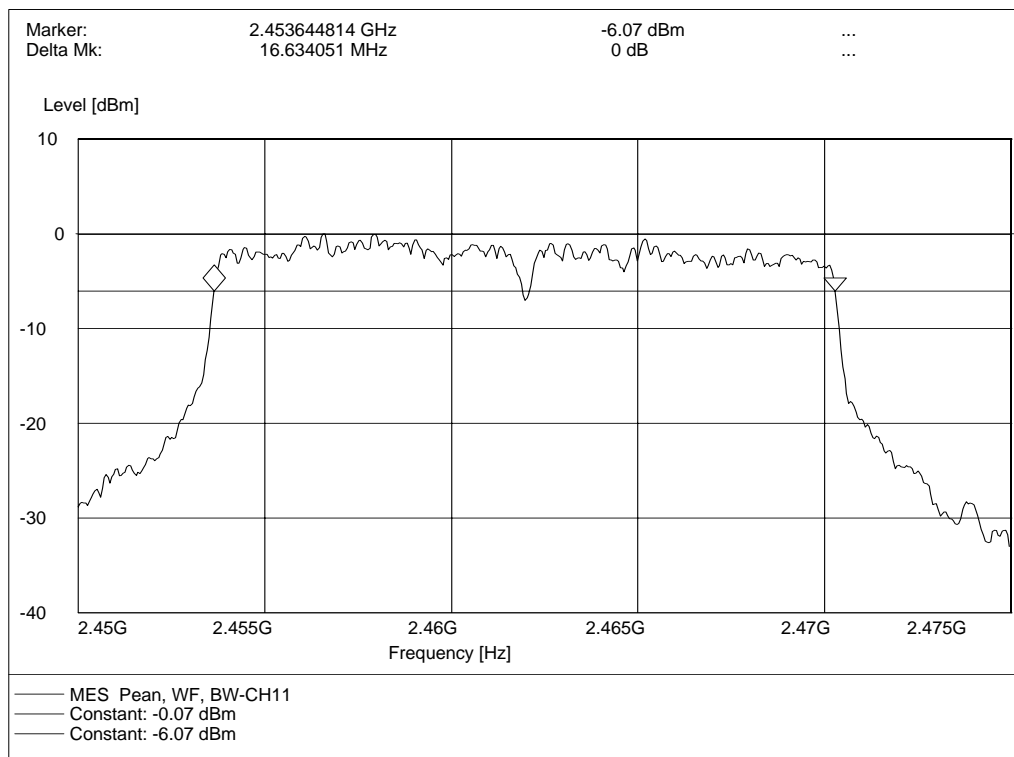
### 1. Lowest channel, 2412MHz



### 2. Middle channel, 2437MHz



## 3. Highest channel, 2462MHz



## 6 Maximum Peak Output Power

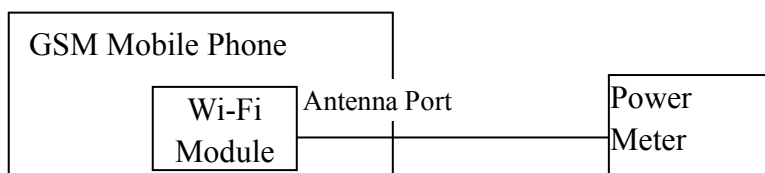
### 6.1 Requirement of the standard

According to FCC §15.247 (b) (3), the maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands is 1 Watt.

### 6.2 Test Procedure

The EUT temporary antenna port was coupled to the power meter. The radio frequency load attached to the EUT antenna terminal was 50 Ohm. The loss of the cables the test system is calibrated to correct the reading.

### 6.3 Test Setup



### 6.4 EUT Setup and Operating Conditions

Same as 5.4

### 6.5 Test Results

| Operating Frequency<br>( MHz ) | Peak Output Power |       | Limit<br>(W) |
|--------------------------------|-------------------|-------|--------------|
|                                | (dBm)             | (W)   |              |
| 2412                           | 16.01             | 0.040 | 1            |
| 2437                           | 15.86             | 0.039 | 1            |
| 2462                           | 15.91             | 0.039 | 1            |

## 7 Band Edge

### 7.1 Requirement of the standard

According to FCC §15.247(c), 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 or a radiated measurement.

### 7.2 Test Procedure

- The EUT was coupled to the spectrum analyzer and the base station simulator through a power divider. The radio frequency load attached to the EUT antenna terminal was 50 Ohm. The loss of the cables the test system is calibrated to correct the reading.
- The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.
- According to the standard requirement, the resolution bandwidth of the spectrum analyzer was set to RBW=100 kHz, VBW=300 kHz.

### 7.3 Test Setup

Same as 5.3

### 7.4 EUT Setup and Operating Conditions

Same as 5.4.

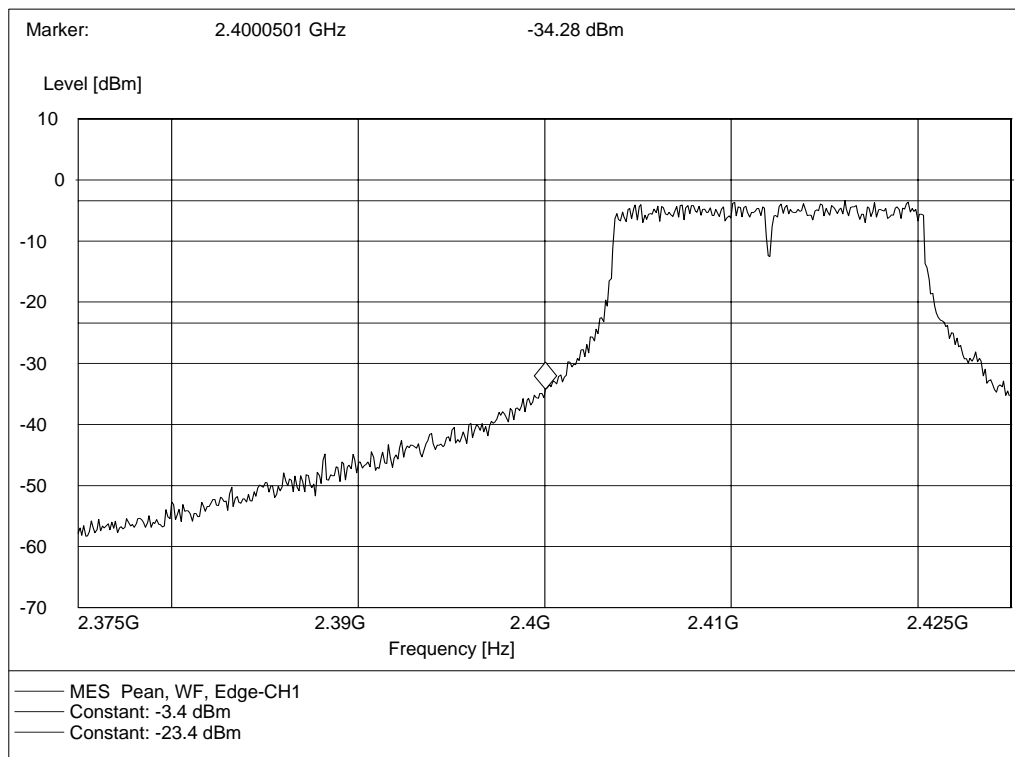
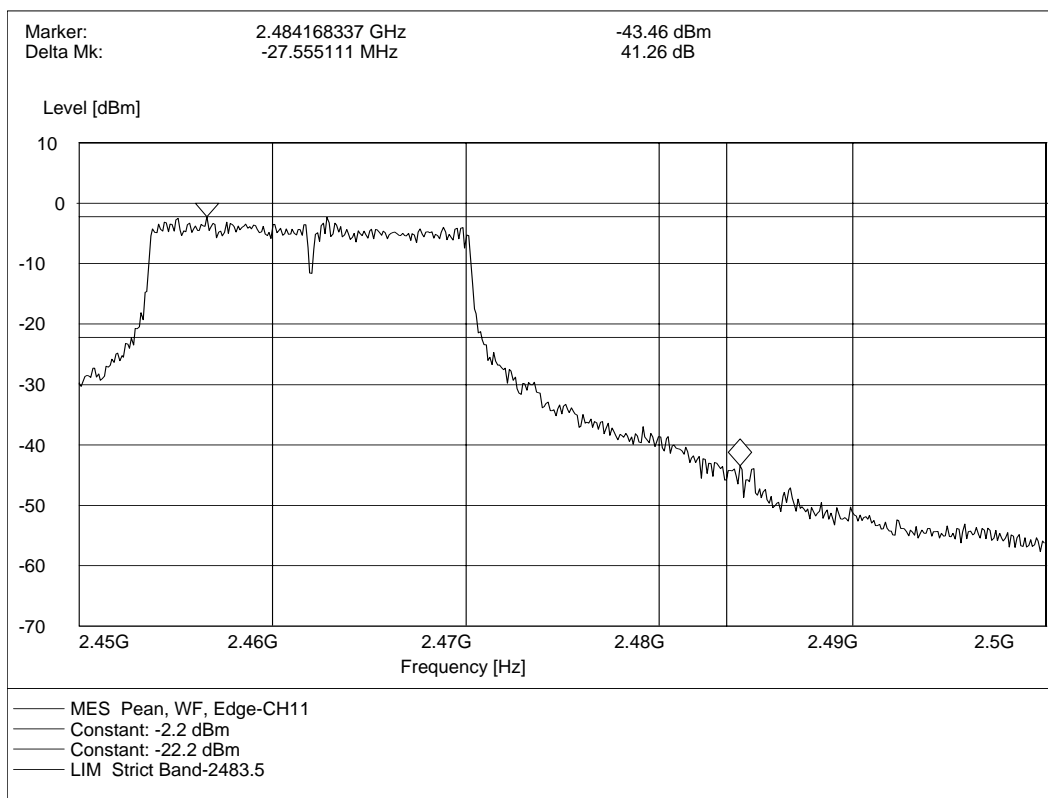
### 7.5 Test Results

The radio frequency power beyond the band edges was 20dB below the peak output power, measured with 100 kHz resolution bandwidth. Refer to the following test plots.

Field strength of band edge emission falling in adjacent restricted bands (2483.5MHz - 2500MHz) per section 15.205(a) was calculated according to Marker-Delta Method DA 00-705. Refer to chapter 4.5 for step 1 in-band field strength measurement. Calculation results in the following table shows compliance with the radiated emission limits specified in Section 15.209(a).

| Fundamental Emission |                         |          | Freq. of Max. Band Edges Emission (MHz) | Delta Marker (dB) | Calculated Max. Band Edges Emission Level (dBμV/m) | Limit (dBμV/m) |
|----------------------|-------------------------|----------|---|-------------------|--|----------------|
| Freq.                | Field Strength (dBμV/m) | Detector |   |                   |  |                |
| 2462.00              | 95.43                   | PK       | 2484.17                                 | 41.26             | 54.17  | 74             |
| 2462.00              | 84.52                   | AV       | 2484.17                                 | 41.26             | 43.26  | 54             |



**Band Edge Test Plots****1. Lowest channel, 2412MHz****2. Highest channel, 2462MHz**

## 8 Conducted Spurious Emission

### 8.1 Requirement of the standard

According to FCC §15.247(c), 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 or a radiated measurement..

### 8.2 Test Procedure

- a. The EUT was coupled to the spectrum analyzer and the base station simulator through a power divider. The radio frequency load attached to the EUT antenna terminal was 50 Ohm. The loss of the cables the test system is calibrated to correct the reading.
- b. The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.
- c. The spurious Emissions from 9 KHz to 10th harmonic of the fundamental frequency were researched.
- d. According to the standard requirement, the resolution bandwidth of the spectrum analyzer was set to RBW=100 kHz, VBW=300 kHz.

### 8.3 Test Setup

Same as 5.3

### 8.4 EUT Setup and Operating Conditions

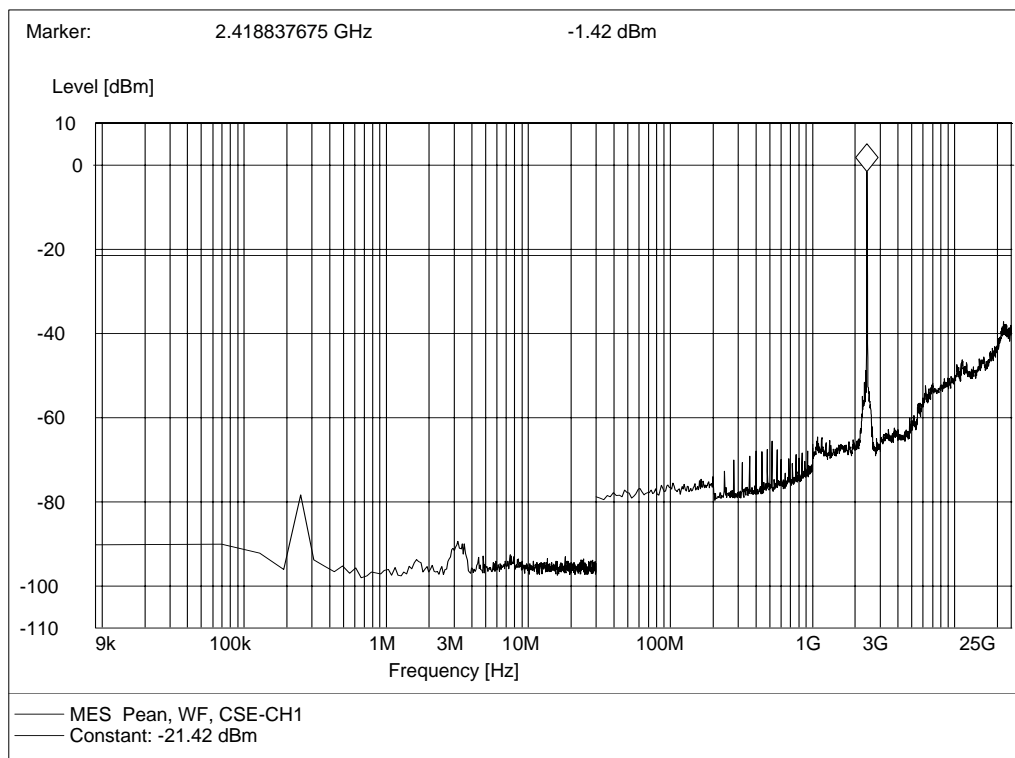
Same as 5.4

## 8.5 Test Results

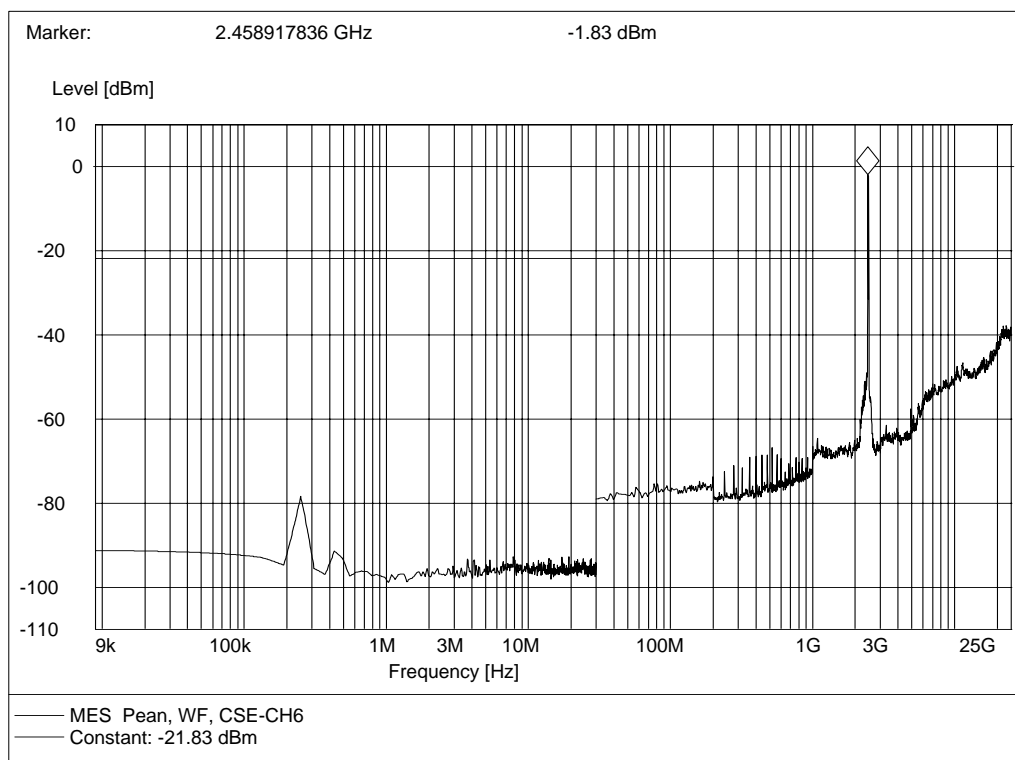
The following test plots shows that spurious emissions in the whole frequency range were below the 20dBc limit line.

### Conducted Spurious Emission Test Plots

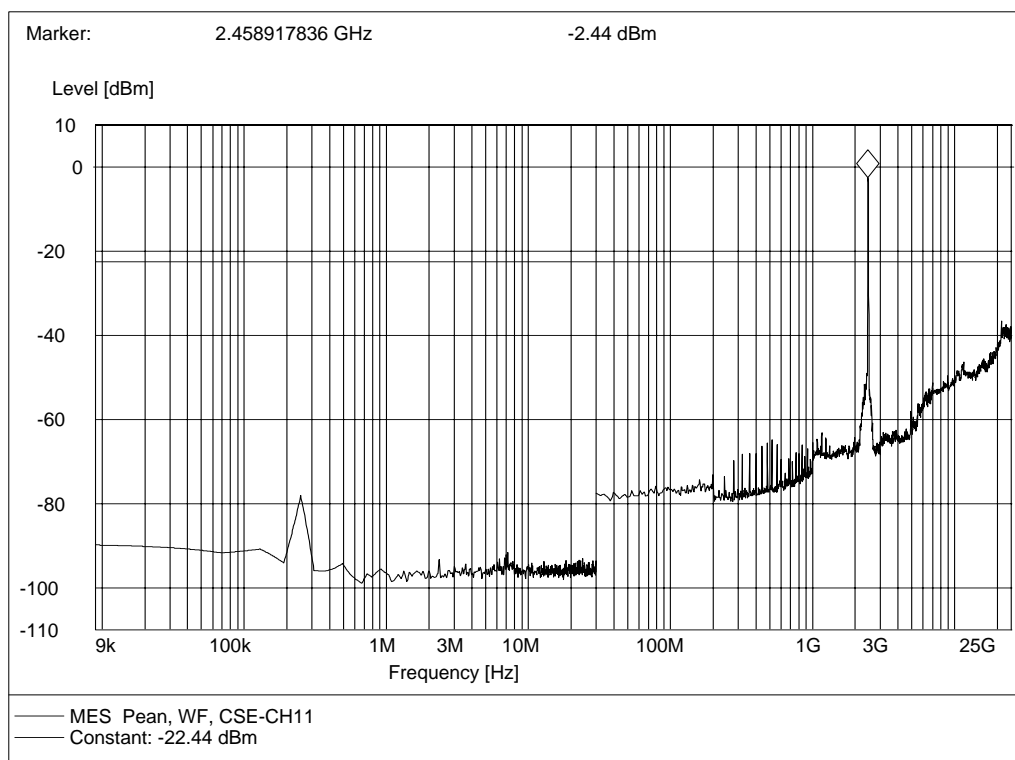
#### 1. Lowest channel, 2412MHz



## 2. Middle channel, 2437MHz



## 3. Highest channel, 2462MHz



## 9 Power Spectrum Density Measurement

### 9.1 Limits of Power Spectrum Density

According to FCC §15.247(d), for digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 9.2 Test Procedure

- a. The EUT temporary antenna port was coupled to the spectrum analyzer. The loss of the cables the test system is calibrated to correct the reading.
- b. The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.
- c. The resolution bandwidth of the spectrum analyzer was set to 3 kHz.

### 9.3 Test Setup

Same as 5.3

### 9.4 EUT Setup and Operating Conditions

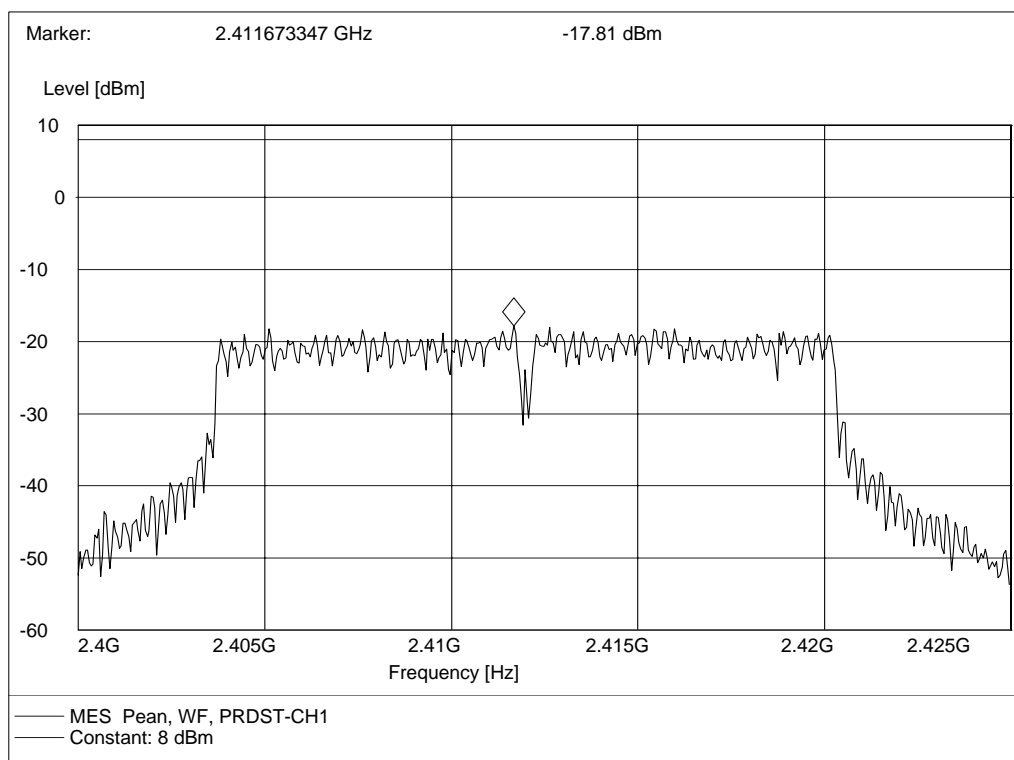
Refer to 5.4.

### 9.5 Test Results

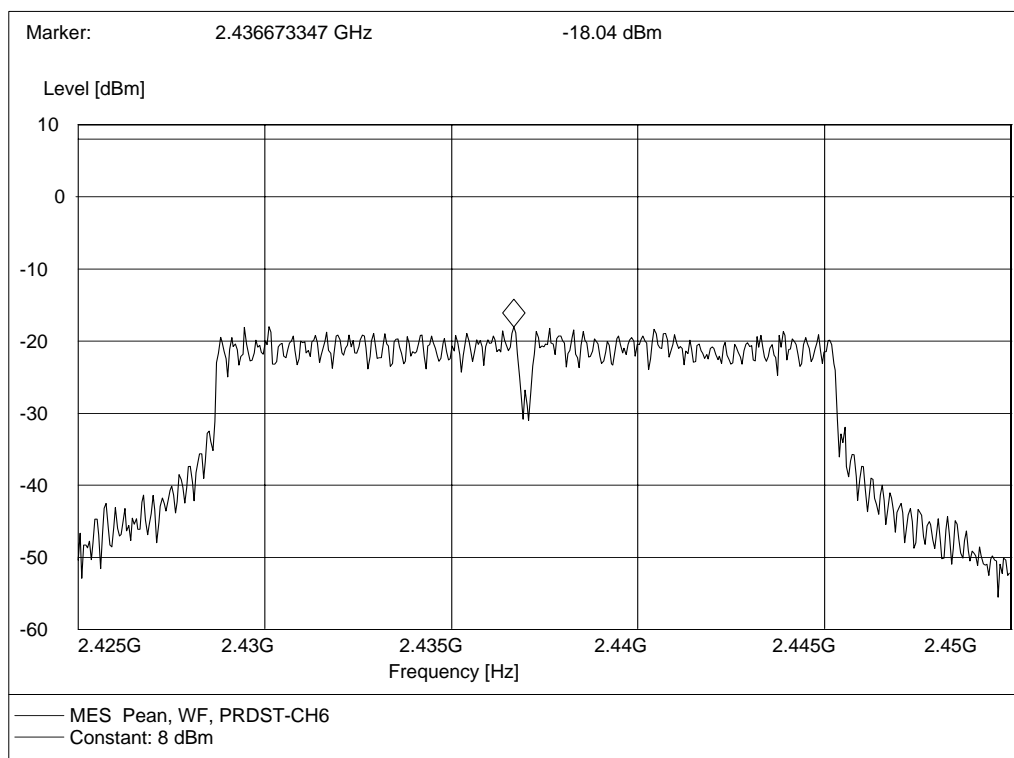
| Operating Frequency<br>( MHz ) | Power spectrum density<br>(dBm/3kHz) | Limit<br>(dBm/3kHz) |
|--------------------------------|--------------------------------------|---------------------|
| 2412                           | -17.81                               | 8                   |
| 2437                           | -18.04                               |                     |
| 2462                           | -18.20                               |                     |

## Plots of Power Spectrum Density

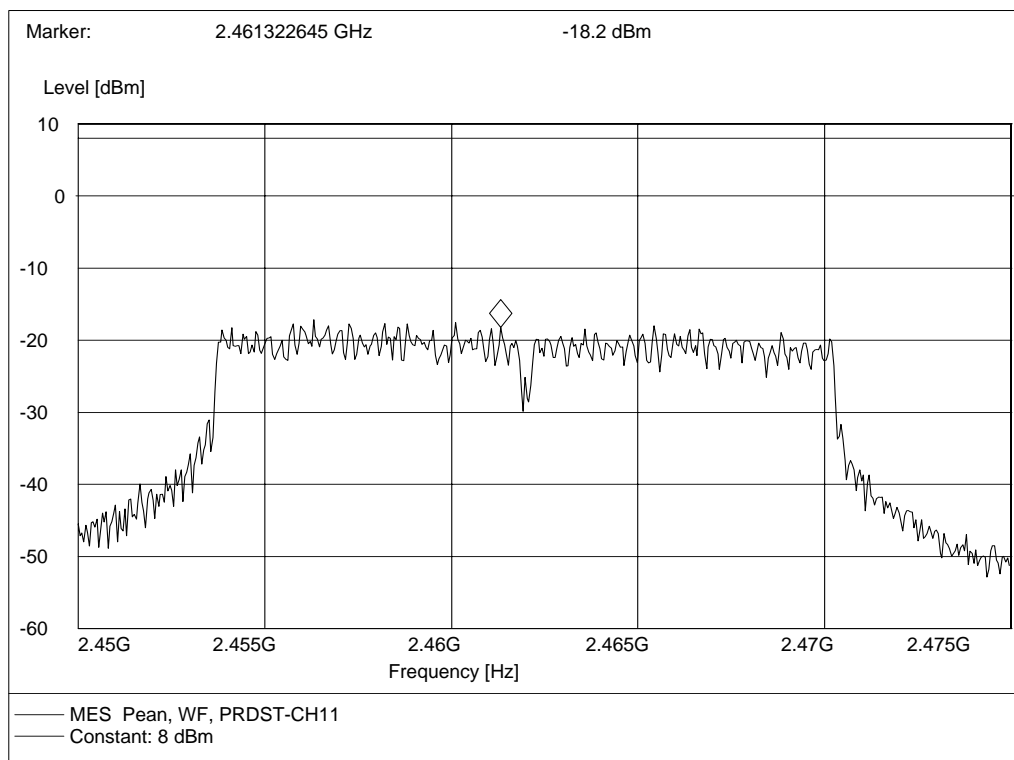
### 1. Lowest channel, 2412MHz



### 2. Middle channel, 2437MHz



## 3. Highest channel, 2462MHz



## Appendix I : Photographs of the EUT

### 1. Appearance of the MS



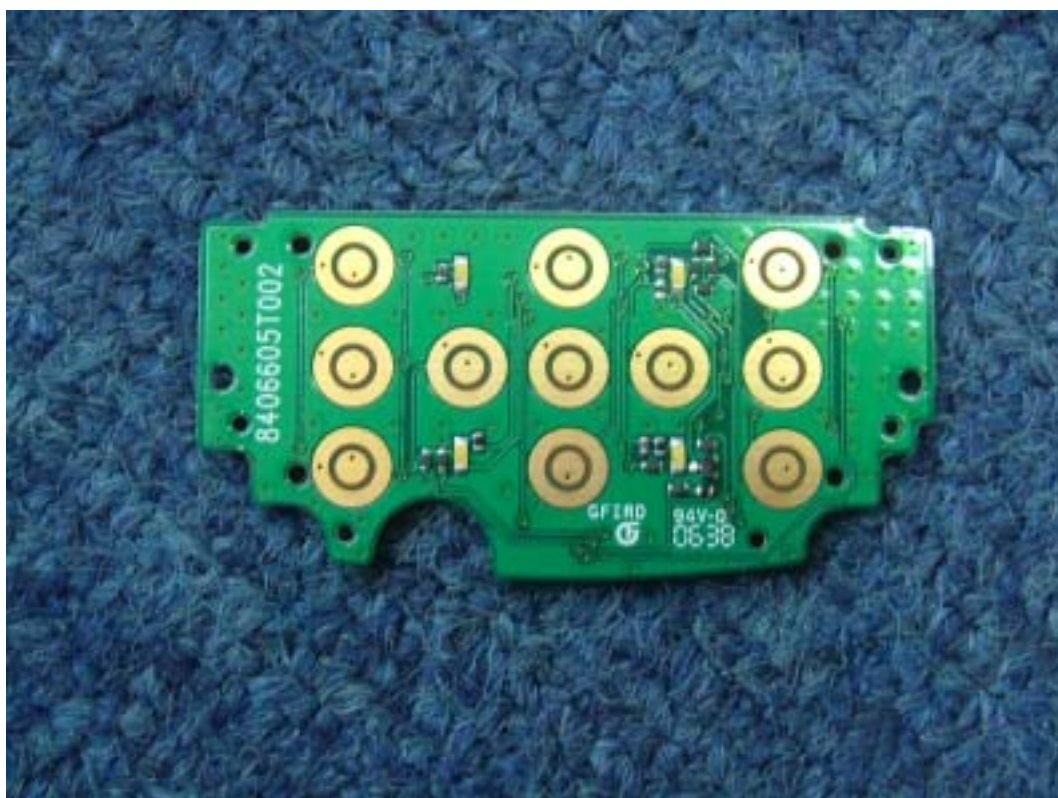
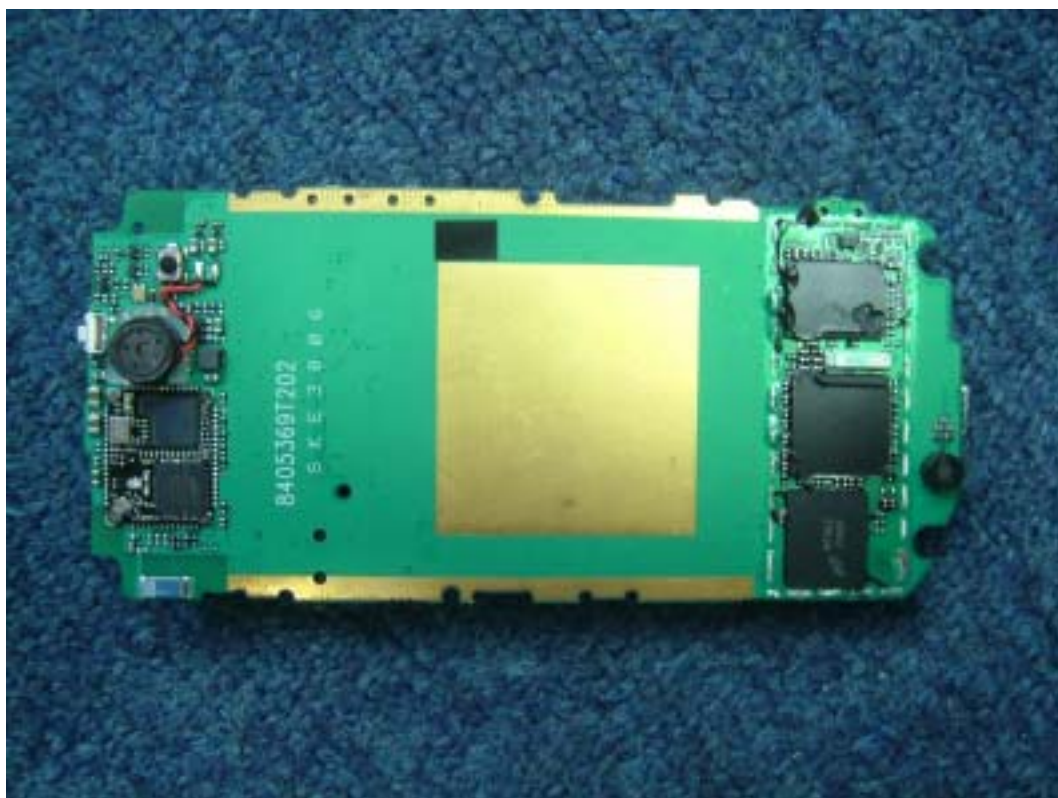


## 2. Inside of the MS











## **Appendix II : Photographs of the Test Configuration**

### **1. Conducted Emission Test**



### **2. Radiated Emission Test (9 kHz -30 MHz)**

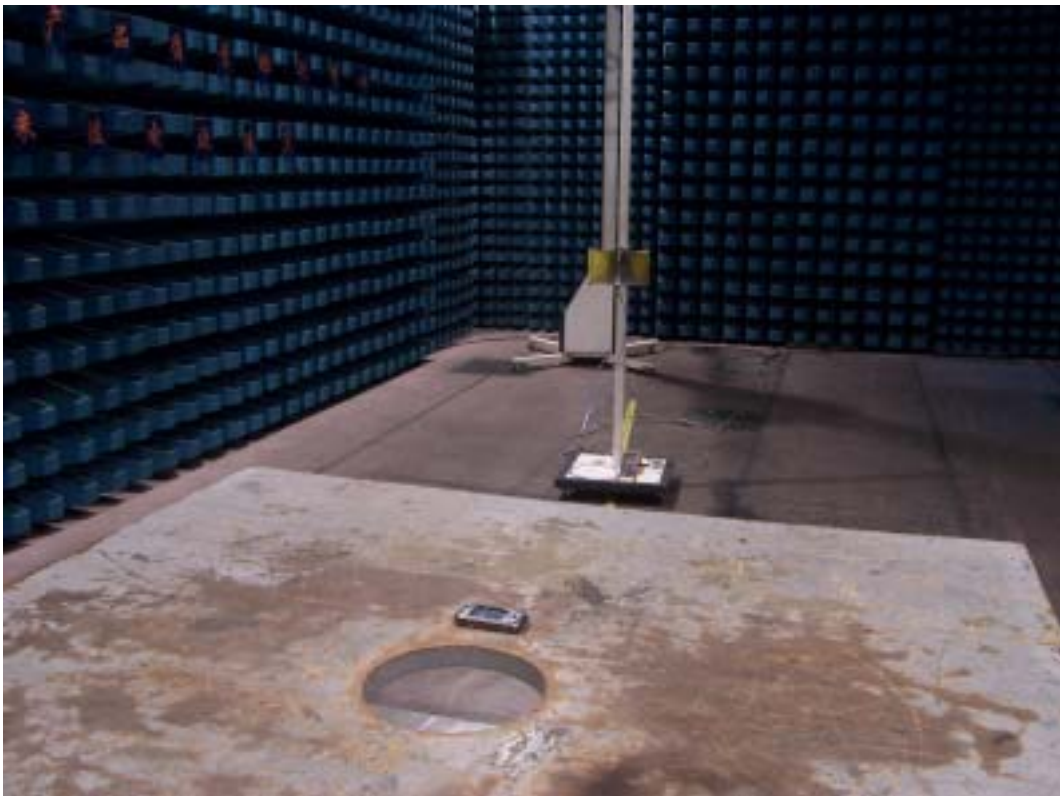




### 3. Radiated Emission Test (30 MHz – 1 GHz)



### 4. Radiated Emission Test (above 1 GHz)



## 5. Conducted RF Test

