TECHNICAL REPORT




**ISO/IEC17025Accredited Lab.**

Report No: FCC 1108111
File reference No: 2011-11-16

Applicant: Dongguan Jinchi Industrial Co., Ltd

Product: outdoor highspeed coax helicopter

Model No: Radio control(X5)

Trademark: extreme flyers

Test Standards: FCC Part 15 Subpart C, Paragraph 15.247

Test result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.4&FCC Part 15 Subpart C, Paragraph 15.247 regulations for the evaluation of electromagnetic compatibility

Approved By

Jack Chung

Jack Chung
Manager

Dated: Nov 16,2011

**Results appearing herein relate only to the sample tested**
**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**

**SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO LTD**

5/F,Block 4, Anhua Industrial Zone.,No.8 TaiRan Rd.CheGongMiao,FuTian District, Shenzhen,CHINA.

Tel (755) 83448688 Fax (755) 83442996

## Special Statement：

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAL. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

**CNAL-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAL/AC01:2002 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of testing Laboratories.

**FCC-Registration No.: 899988**

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 899988.

**IC- Registration No.: IC5205A-01**

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration IC No.: 5205A-01.

Test Report Conclusion

Content

1.0 **General Details**

1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO LTD

Address: 5/F,Block 4, Anhua Industrial Zone.,No.8 TaiRan Rd.CheGongMiao,FuTian District, Shenzhen,CHINA.

Telephone: (755) 83448688

Fax: (755) 83442996

Site on File with the Federal Communications Commission – United Sates

Registration Number: 899988

For 3m & 10 m OATS

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A-01

For 3m & 10 m OATS

1.2 Applicant Details

Applicant: Dongguan Jinchi Industrial Co., Ltd

Address: No.8 (origin), Mumian industrial district, Dongshan Village, Qishi Town, Dongguan city.

Telephone: +86 -0769-82202588

Fax: +86 -0769-82206609

1.3 Description of EUT

| | |
|---|---|
| Product: | outdoor highspeed coax helicopter |
| Manufacturer: | Dongguan Jinchi Industrial Co., Ltd |
| Brand Name: | extreme flyers |
| Model Number: | Radio control(X5) |
| Additional Model Name | N/A |
| Additional Trade Name | N/A |
| Rating: | DC6V (4 pcs AA Batteries) |
| Power Supply: | N/A |
| Type of Modulation | GFSK |
| Frequency range | 2403-2478MHz |
| Number of Channel | 76 |
| Air Data Rate | 125kbps |
| Antenna type | PCB Printed antenna |

1.4 Submitted Sample: 3 Sample

1.5 Test Duration

2011-08-16 to 2011-11-16

1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions Uncertainty =4.7dB

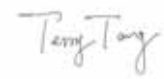
1.7 Test Engineer &verify Engineer

Test Engineer

The sample(s) tested by 

Print Name: Brown Lu/ Engineer

Verify Engineer

The report verified by 

Print Name: Terry Tang/ EMC Manager

| 2.0 | Test Equipments | | | | |
|---|---|---|---|---|---|
| Instrument Type | Manufacturer | Model | Serial No. | Date of Cal. | Due Date |
| ESPI Test Receiver | ROHDE&SCHWARZ | ESPI 3 | 100379 | 2011-04-26 | 2012-04-25 |
| TWO Line-V-NETW | ROHDE&SCHWARZ | EZH3-Z5 | 100294 | 2011-04-26 | 2012-04-25 |
| TWO Line-V-NETW | ROHDE&SCHWARZ | EZH3-Z5 | 100253 | 2011-04-26 | 2012-04-25 |
| Ultra Broadband ANT | ROHDE&SCHWARZ | HL562 | 100157 | 2011-04-26 | 2012-04-25 |
| ESDV Test Receiver | ROHDE&SCHWARZ | ESDV | 100008 | 2011-04-26 | 2012-04-25 |
| Impuls-Begrenzer | ROHDE&SCHWARZ | ESH3-Z2 | 100281 | 2011-04-26 | 2012-04-25 |
| System Controller | CT | SC100 | - | 2011-04-26 | 2012-04-25 |
| Printer | EPSON | PHOTO EX3 | CFNH234850 | 2011-04-26 | 2012-04-25 |
| Computer | IBM | 8434 | 1S8434KCE99BLX LO* | - | - |
| Bilog Antenna | Chase | CBL6111C | 2576 | 2011-04-26 | 2012-04-25 |
| Loop Antenna | EMCO | 6502 | 00042960 | 2011-04-26 | 2012-04-25 |
| ESPI Test Receiver | ROHDE&SCHWARZ | ESI26 | 838786/013 | 2011-04-26 | 2012-04-25 |
| 3m OATS | -- | -- | N/A | 2011-04-26 | 2012-04-25 |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170265 | 2011-04-26 | 2012-04-25 |
| Horn Antenna | SCHWARZBECK | BBHA 9120D | 9120D-631 | 2011-04-26 | 2012-04-25 |
| Power meter | Anritsu | ML2487A | 6K00003613 | 2011-04-26 | 2012-04-25 |
| Power sensor | Anritsu | MA2491A | 32263 | 2011-04-26 | 2012-04-25 |
| Bilog Antenna | Schwarebeck | VULB9163 | 9163/340 | 2011-04-26 | 2012-04-25 |
| LISN | AFJ | LS16C | 10010947251 | 2011-04-26 | 2012-04-25 |
| LISN (Three Phase) | Schwarebeck | NSLK 8126 | 8126453 | 2011-04-26 | 2012-04-25 |
| 9*6*6 Anechoic | -- | -- | N/A | 2011-04-26 | 2012-04-25 |
| EMI Test Receiver | RS | ESCS30 | 100139 | 2011-04-26 | 2012-04-25 |
| LISN | AFJ | LS16C | 10010947251 | 2011-04-26 | 2012-04-25 |
| LISN (Three Phase) | Schwarebeck | NSLK 8126 | 8126453 | 2011-04-26 | 2012-04-25 |

## 3.0 Technical Details

### 3.1 Summary of test results

**The EUT has been tested according to the following specifications:**

| Standard | Test Type | Result | Notes |
|---|---|---|---|
| Antenna Requirement | 15.203, 15.247(b)(4) | PASS | Complies |
| Maximum Peak Out Power | 15.247 (b)(1), (4) | PASS | Complies |
| Carrier Frequency Separation | 15.247(a)(1) | PASS | Complies |
| 20dB Channel Bandwidth | 15.247 (a)(1) | PASS | Complies |
| Number of Hopping Channels | 15.247(a)(iii), 15.247(b)(1) | PASS | Complies |
| Time of Occupancy (Dwell Time) | 15.247(a)(iii) | PASS | Complies |
| Spurious Emission, Band Edge, and Restricted bands | 15.247(d),15.205(a), 15.209 (a),15.109 | PASS | Complies |
| Conducted Emissions | 15.207(a)，15.107 | PASS | Complies |
| RF Exposure | 15.247(i), 1.1307(b)(1) | PASS | Complies |

### 3.2 Test Standards

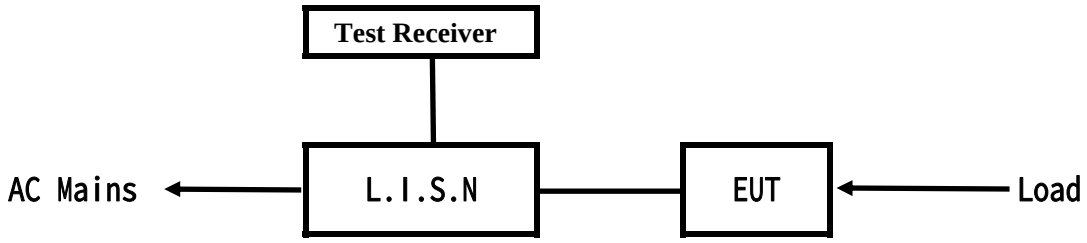
**FCC Part 15 Subpart & Subpart C, Paragraph 15.247**

## 4.0 EUT Modification

**No modification by Shenzhen Timeway Technology Consulting Co.,Ltd**

## 5. Power Line Conducted Emission Test

5.1 Schematics of the test

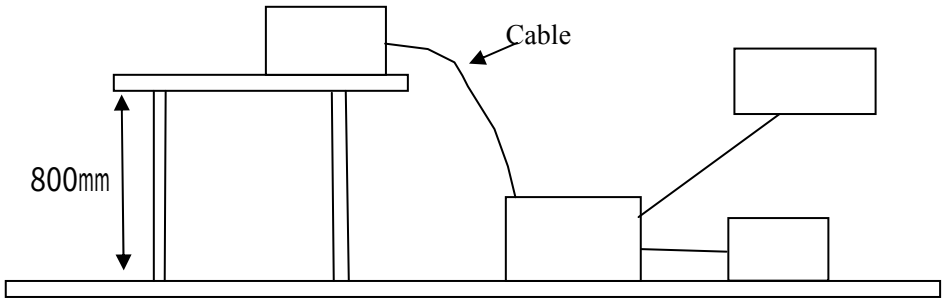



EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.4-2009.The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.4 –2009.

Block diagram of Test setup




5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2003. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

| Device | Manufacturer | Model | FCC ID |
|---|---|---|---|
| outdoor highspeed coax helicopter | Dongguan Jinchi Industrial Co., Ltd | Radio control(X5) | ZYOX350 |

B. Internal Device

| Device | Manufacturer | Model | FCC ID/DOC |
|---|---|---|---|
| N/A | | | |

C. Peripherals

| Device | Manufacturer | Model | FCC ID/DOC | Cable |
|---|---|---|---|---|
| N/A | | | | |

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.4 -2009.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

| Frequency (MHz) | Class A Limits (dB μ V) | | Class B Limits (dB μ V) | |
|---|---|---|---|---|
| | Quasi-peak Level | Average Level | Quasi-peak Level | Average Level |
| 0.15 ～ 0.50 | 79.0 | 66.0 | 66.0～56.0* | 56.0～46.0* |
| 0.50 ～ 5.00 | 73.0 | 60.0 | 56.0 | 46.0 |
| 5.00 ～ 30.00 | 73.0 | 60.0 | 60.0 | 50.0 |

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

**Note: Owing to DC operation of EUT, this test item is not performed**

## 6 Radiated Emission Test

6.1 Test Method and test Procedure:

(1) The EUT was tested according to ANSI C63.4 –2009. The radiated test was performed at Timeway Laboratory. This site is on file with the FCC laboratory division, Registration No.899988

(2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2009.

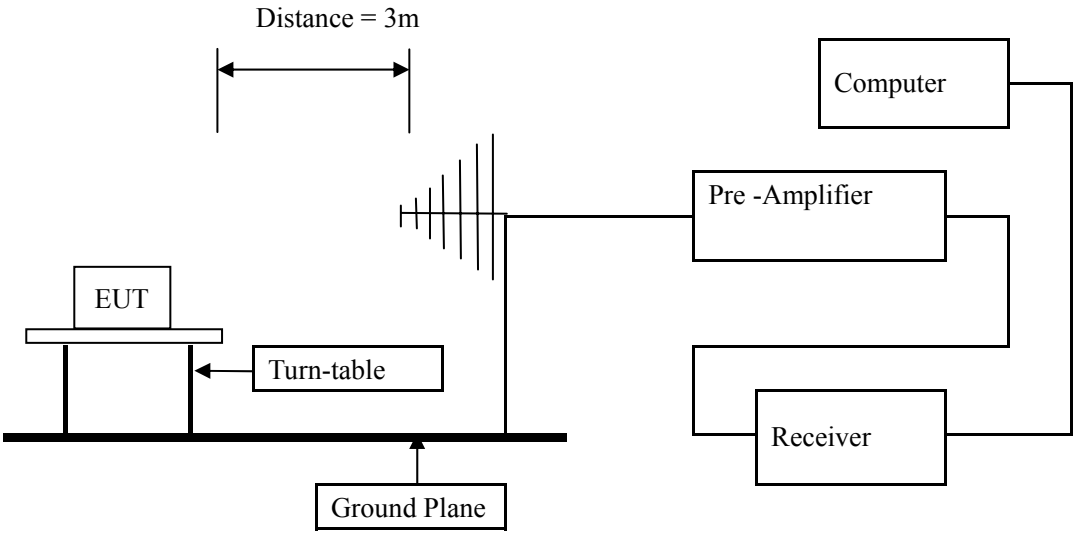
(3) The frequency spectrum from 30 MHz to 1 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.

(4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

(5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "**QP**" in the data table.

(6) The antenna polarization : Vertical polarization and Horizontal polarization.

**Block diagram of Test setup**




6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

**Frequencies in restricted band are complied to limit on Paragraph 15.209**

| Frequency Range (MHz) | Distance (m) | Field strength (dB μ V/m) |
|---|---|---|
| 30-88 | 3 | 40.0 |
| 88-216 | 3 | 43.5 |
| 216-960 | 3 | 46.0 |
| Above 960 | 3 | 54.0 |

Note: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the higher limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

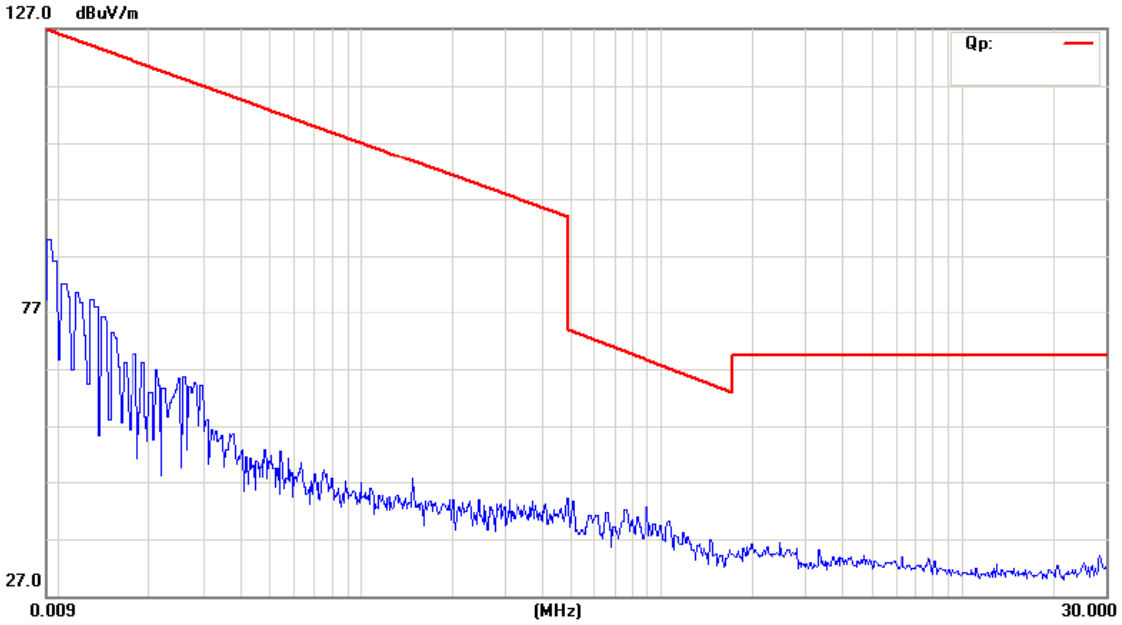
## General Radiated Emission Data and Harmonics Radiated Emission Data

### Radiated Emission In Horizontal (0.009MHz----30MHz)

EUT set Condition: Transmitting (Low CH)

**Results:** **Pass**

Please refer to following diagram for individual




| Frequency (MHz) | Level@3m (dB μ V/m) | Limit@3m (dB μ V/m) |
|---|---|---|
| -- | -- | -- |

-The test data shows much less than the limit, no necessary take down the records.

**Test result**

## General Radiated Emission Data and Harmonics Radiated Emission Data

**Radiated Emission In Horizontal (30MHz----1000MHz)**

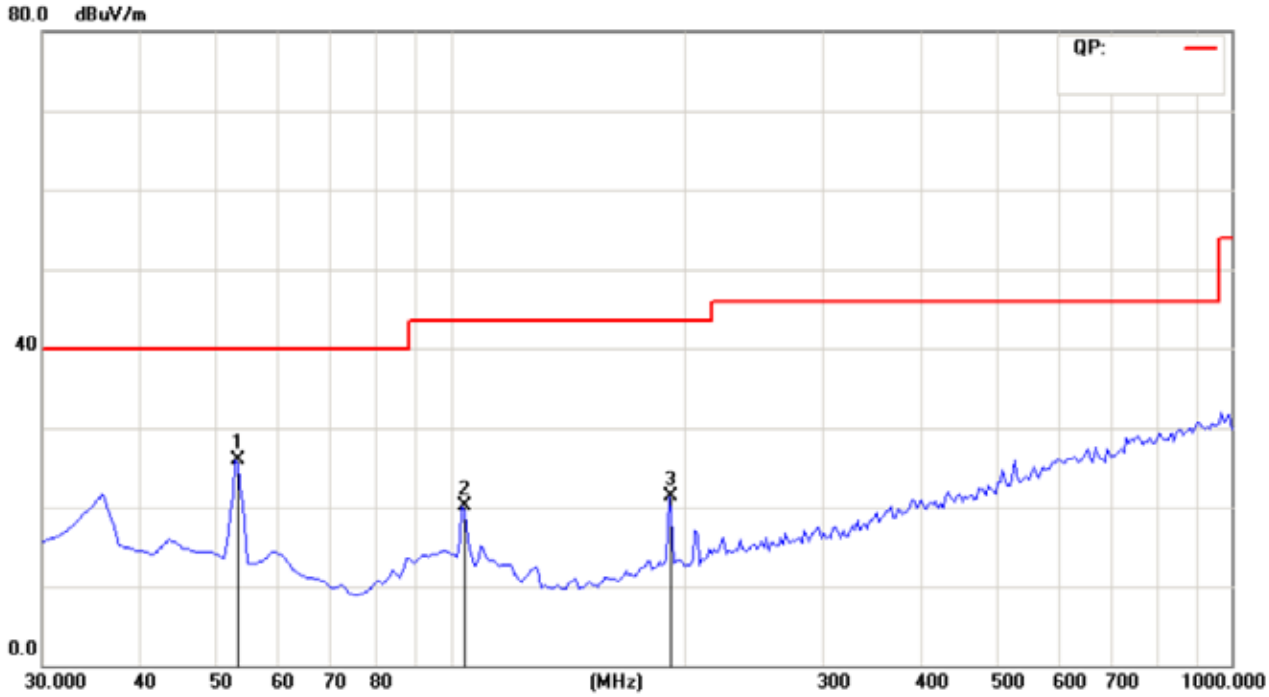
EUT set Condition: Tx under transmitting mode

**Results:** **Pass**

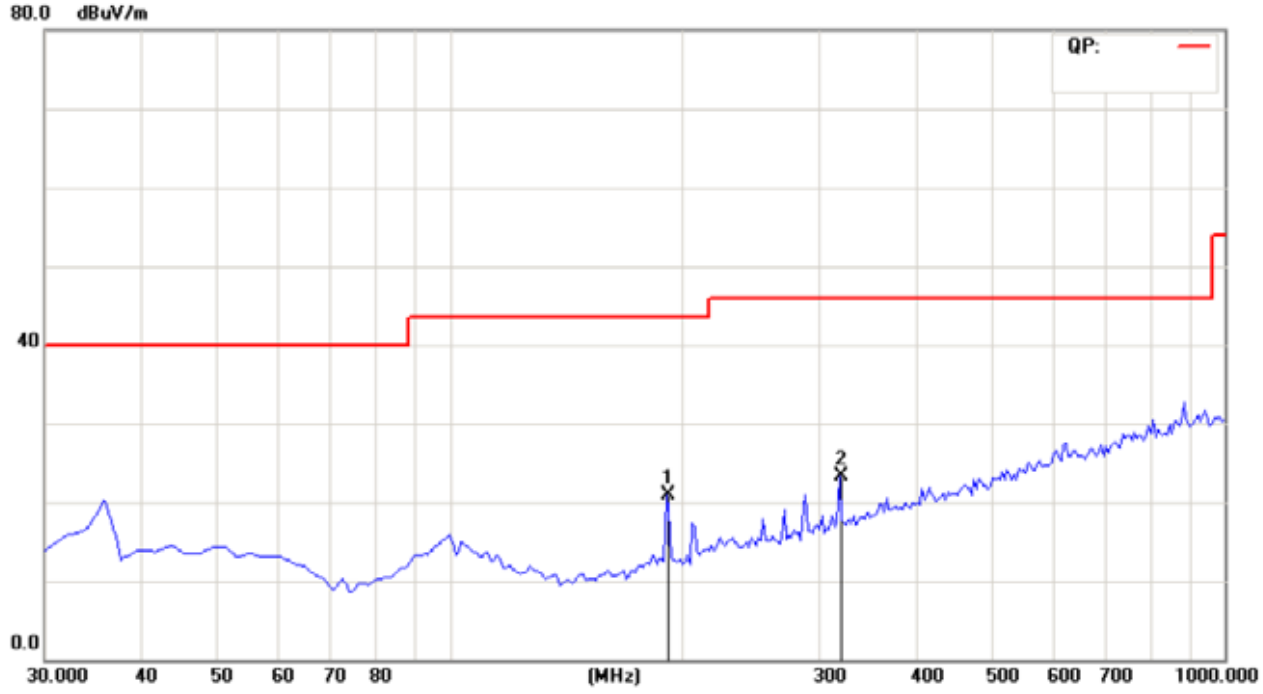
| Frequency (MHz) | Level@3m (dB μ V/m) | Antenna Polarity | Limit@3m (dB μ V/m) |
|---|---|---|---|
| 53.325 | 25.83 | V | 40.00 |
| 103.532 | 20.54 | V | 43.50 |
| 191.342 | 22.97 | V | 46.00 |
| 191.342 | 20.43 | H | 43.50 |
| 319.341 | 23.32 | H | 46.00 |

**Test Figure: transmitting mode**

## Vertical




## Horizontal



**Operation Mode: Transmitting under Low Channel**

| Frequency (MHz) | Level@3m (dB μ V/m) | Antenna Polarity | Limit@3m (dB μ V/m) |
|---|---|---|---|
| 2403.00 | 104.2（PK）/85.3（AV） | H | Fundamental Frequency |
| 2430.00 | 109.5（PK）/88.8（AV） | V | |
| 1608.136 | 40.78（PK）/41.13（PK） | H/V | 74(Peak)/ 54(AV) |
| 4806.00 | 50.18（PK）/53.21（PK） | H/V | 74(Peak)/ 54(AV) |
| 7209 | -- | H/V | 74(Peak)/ 54(AV) |
| 9612 | -- | H/V | 74(Peak)/ 54(AV) |
| 12015 | -- | H/V | 74(Peak)/ 54(AV) |
| 14418 | -- | H/V | 74(Peak)/ 54(AV) |
| 16821 | -- | H/V | 74(Peak)/ 54(AV) |
| 19224 | -- | H/V | 74(Peak)/ 54(AV) |
| 21627 | -- | H/V | 74(Peak)/ 54(AV) |
| 24030 | -- | H/V | 74(Peak)/ 54(AV) |

**Operation Mode: Transmitting under CH Mid**

| Frequency (MHz) | Level@3m (dB μ V/m) | Antenna Polarity | Limit@3m (dB μ V/m) |
|---|---|---|---|
| 2450.00 | 105.2（PK）/83.7（AV） | H | Fundamental Frequency |
| 2450.00 | 108.6（PK）/86.5（AV） | V | |
| 1608.136 | 43.44（PK）/44.23（PK） | H/V | 74(Peak)/ 54(AV) |
| 4900.00 | 52.33（PK）/51.79（PK） | H/V | 74(Peak)/ 54(AV) |
| 7350.00 | --（PK）/46.95（PK） | H/V | 74(Peak)/ 54(AV) |
| 9800.00 | -- | H/V | 74(Peak)/ 54(AV) |
| 12250 | -- | H/V | 74(Peak)/ 54(AV) |
| 14700 | -- | H/V | 74(Peak)/ 54(AV) |
| 17150 | -- | H/V | 74(Peak)/ 54(AV) |
| 19600 | -- | H/V | 74(Peak)/ 54(AV) |
| 22050 | -- | H/V | 74(Peak)/ 54(AV) |
| 24500 | -- | H/V | 74(Peak)/ 54(AV) |

**Operation Mode: Transmitting under CH High**

| Frequency (MHz) | Level@3m (dB μ V/m) | Antenna Polarity | Limit@3m (dB μ V/m) |
|---|---|---|---|
| 2478.00 | 92.1（PK）/76.3（AV） | H | Fundamental Frequency |
| 2478.00 | 95.3（PK）/81.6（AV） | V | |
| 1608.136 | 44.00（PK） | V | 74(Peak)/ 54(AV) |
| 1608.136 | 39.47（PK） | H | |
| 4956 | 50.83（PK） | V | 74(Peak)/ 54(AV) |
| 4956 | 49.26（PK） | H | |
| 4734 | -- | H/V | 74(Peak)/ 54(AV) |
| 9912 | -- | H/V | 74(Peak)/ 54(AV) |
| 12390 | -- | H/V | 74(Peak)/ 54(AV) |
| 14868 | -- | H/V | 74(Peak)/ 54(AV) |
| 17346 | -- | H/V | 74(Peak)/ 54(AV) |
| 19824 | -- | H/V | 74(Peak)/ 54(AV) |
| 22302 | -- | H/V | 74(Peak)/ 54(AV) |
| 24780 | -- | H/V | 74(Peak)/ 54(AV) |

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

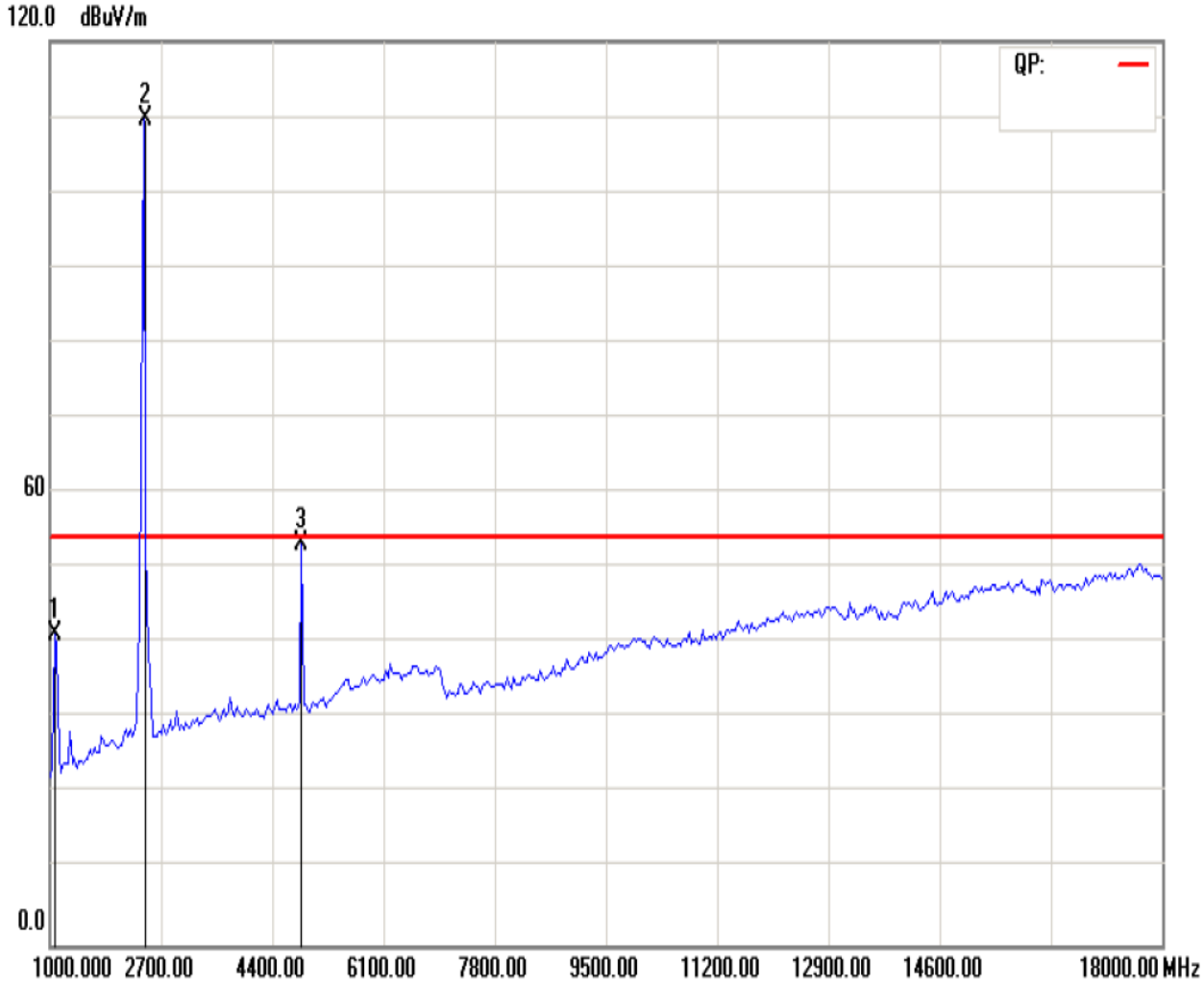
2. Remark “---” means that the emissions level is too low to be measured

3. Margin=Emission-Limits

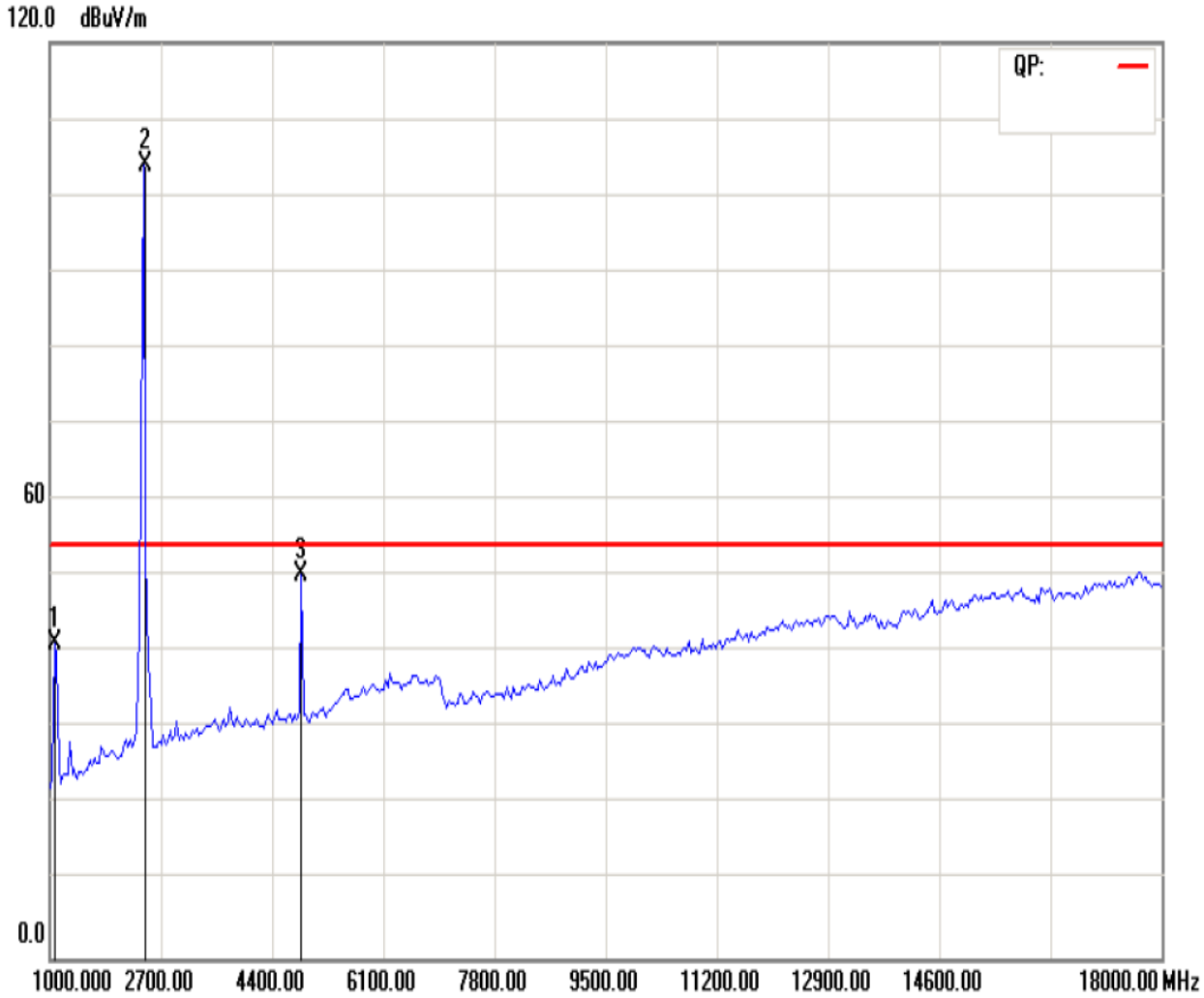
4.According to section 15.35(b), the peak limit is 20dB higher than the average limit

Please refer to the following test plots for details:

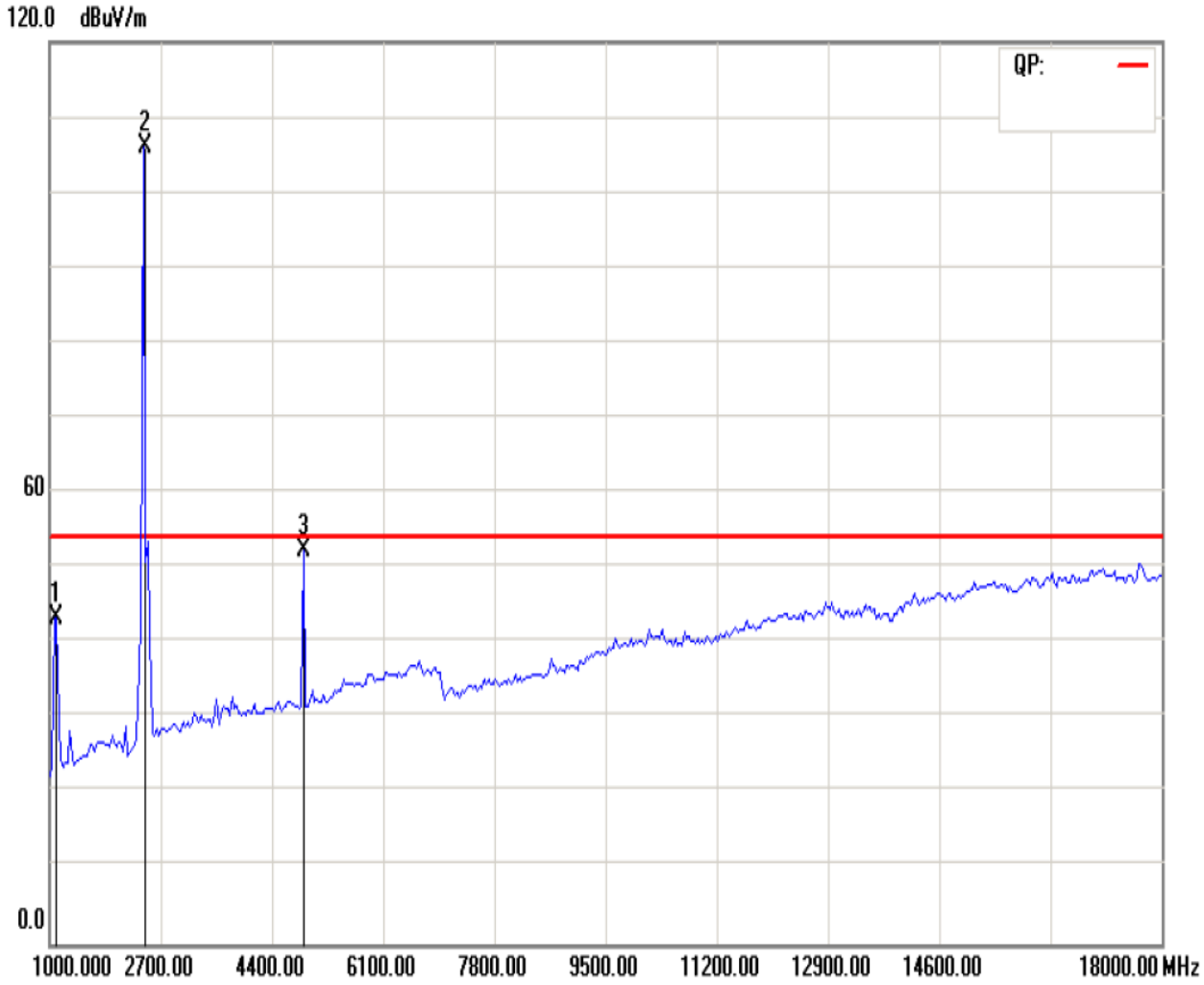
**Low Channel: Vertical**



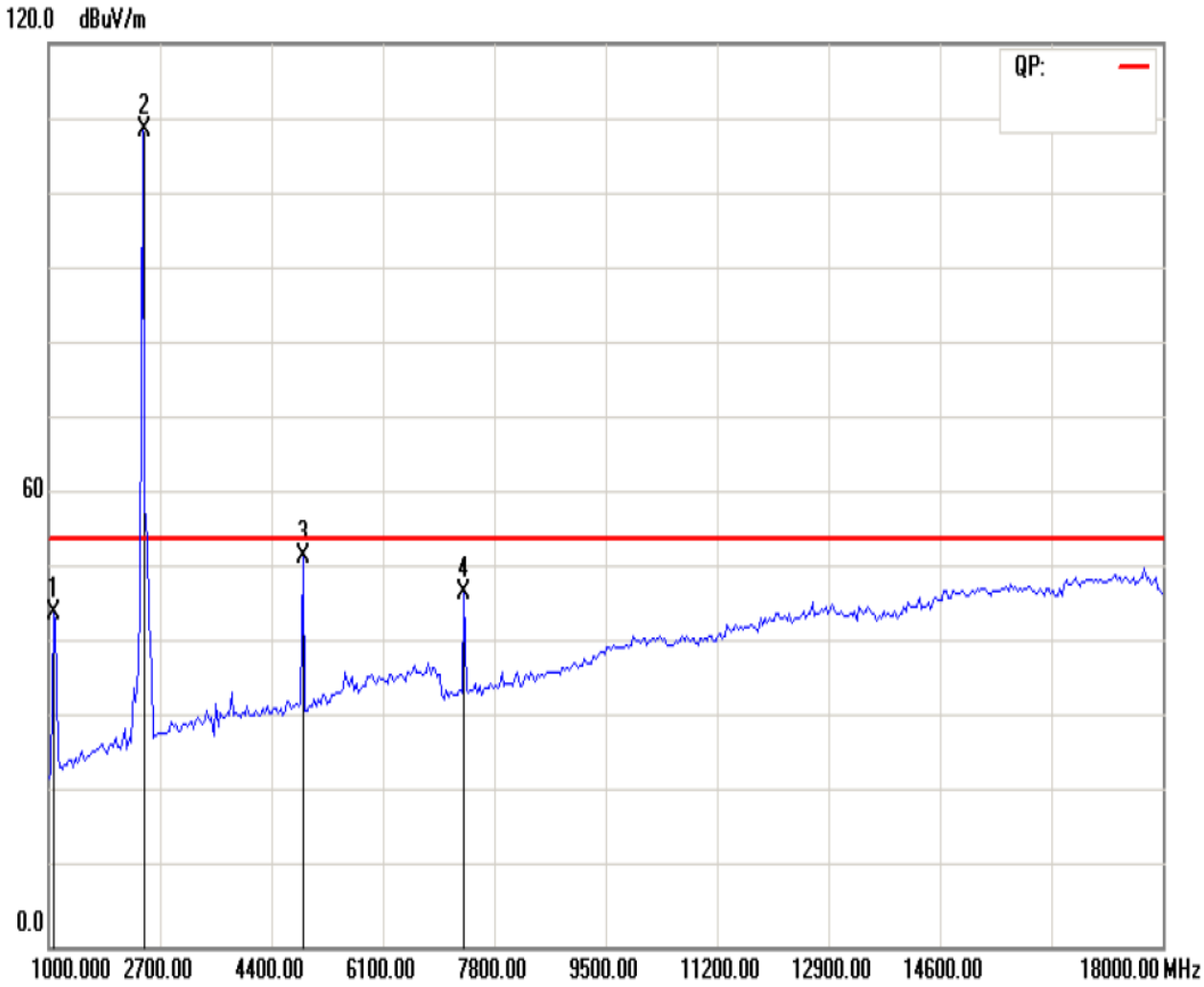
**Low Channel : Horizontal**



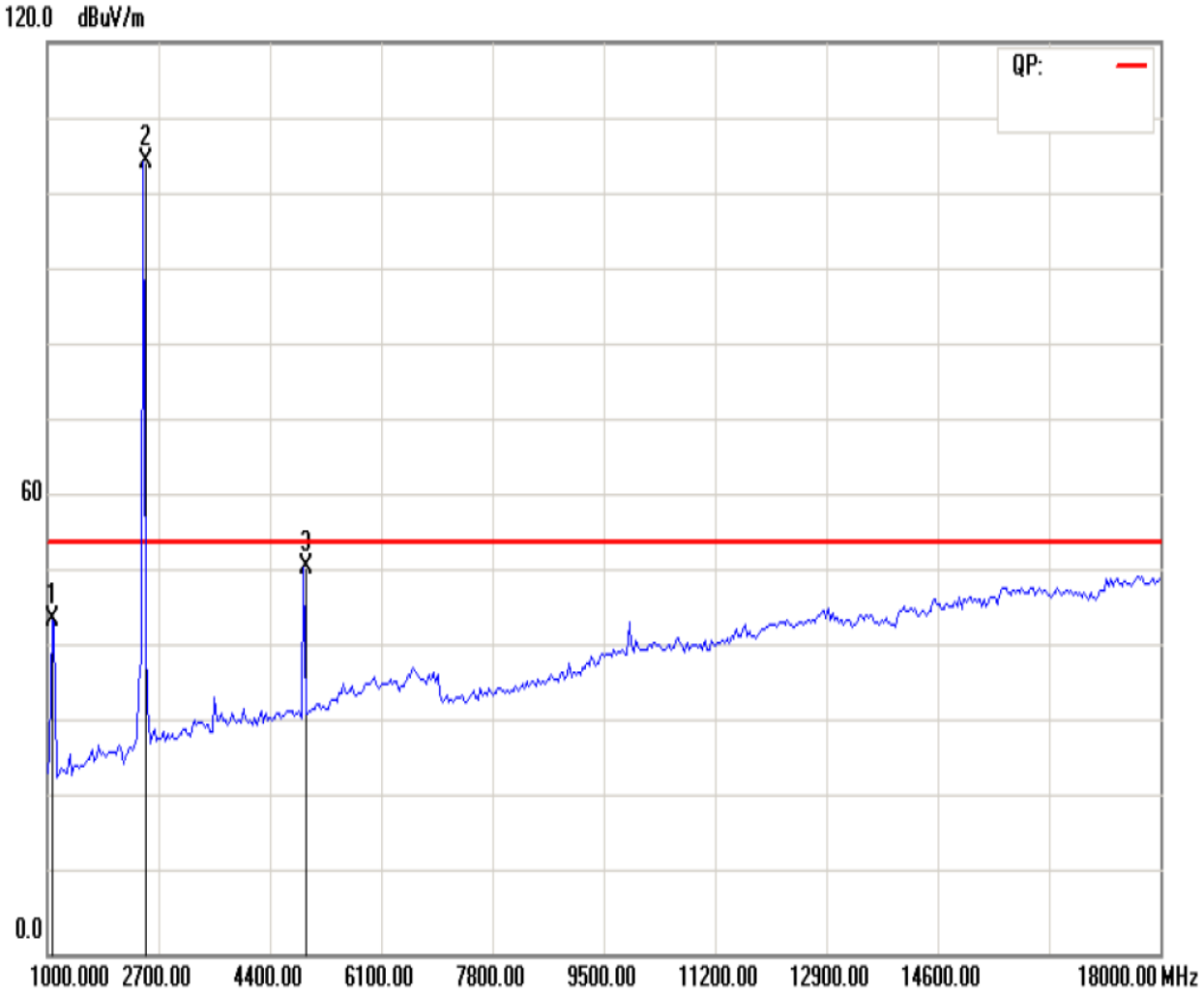
**Middle Channel : Horizontal**



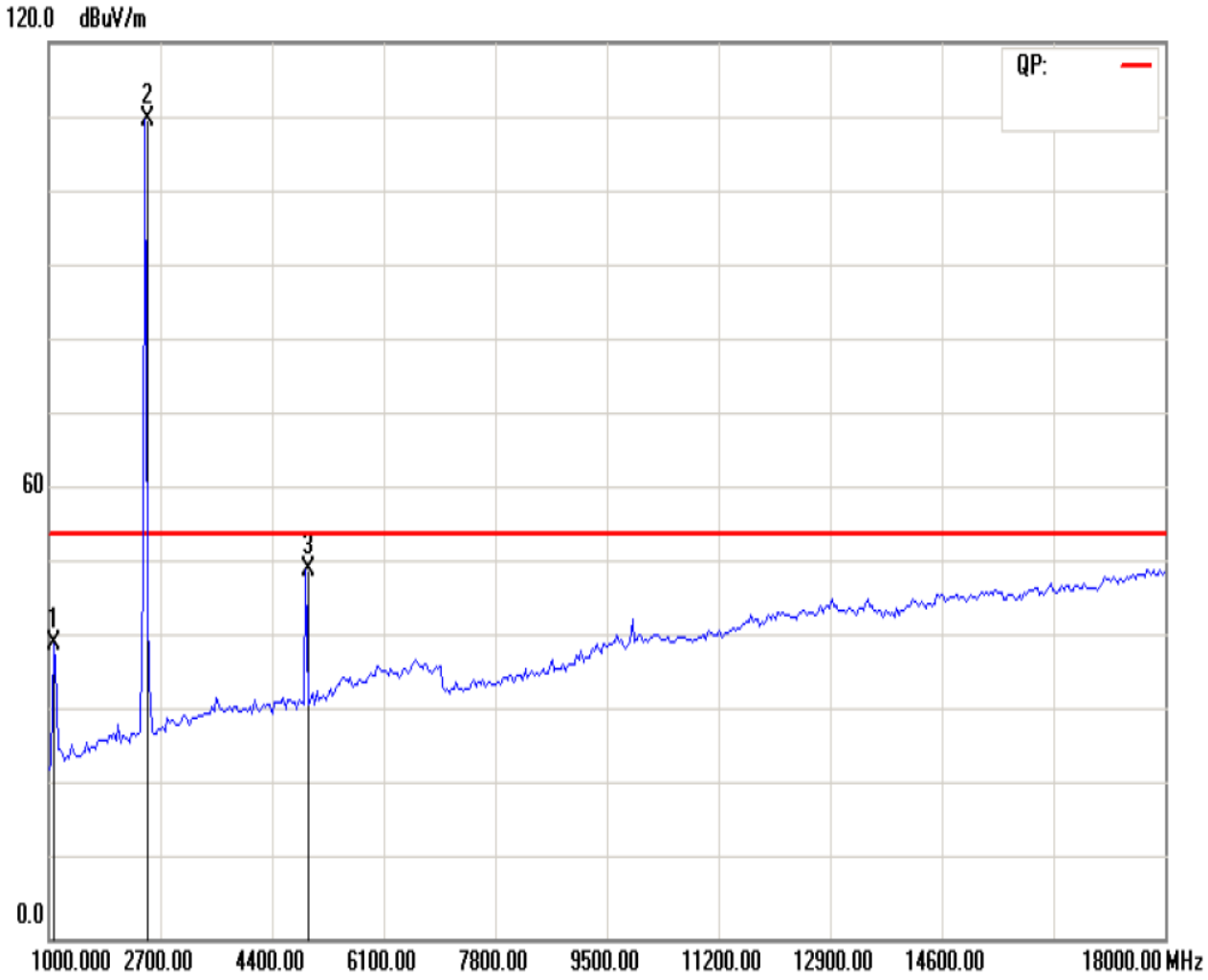
**Middle Channel : Vertical**



**High Channel : Horizontal**

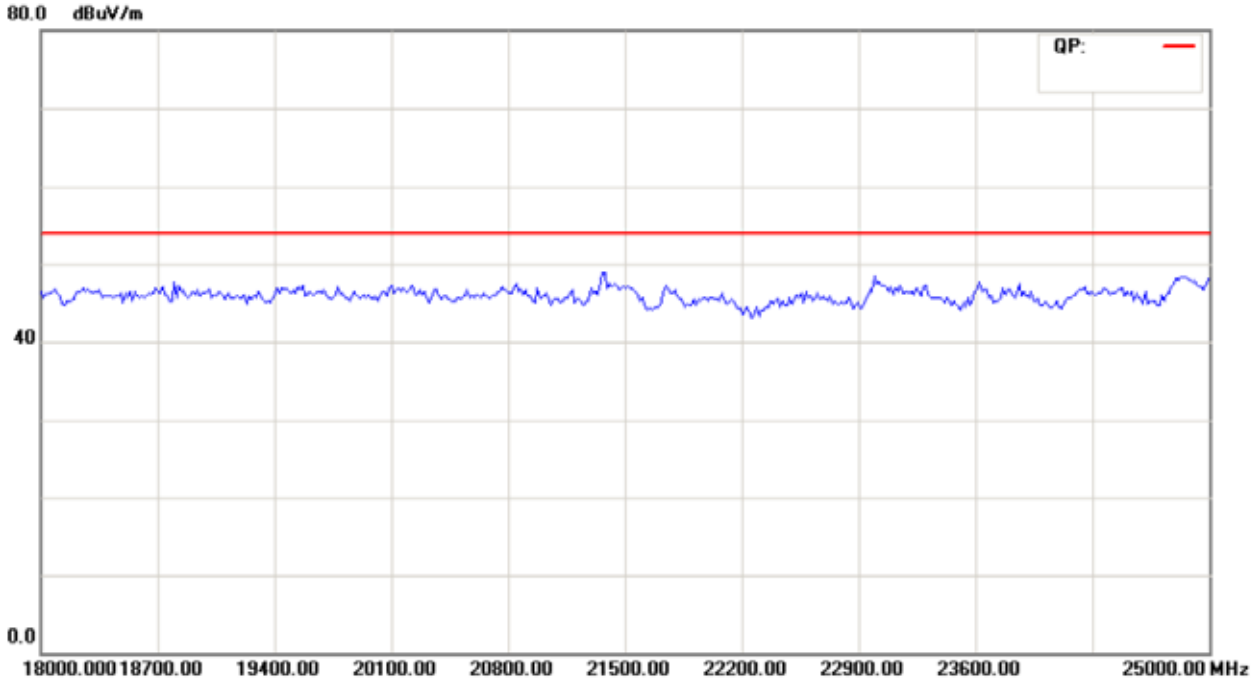


**High Channel : Vertical**



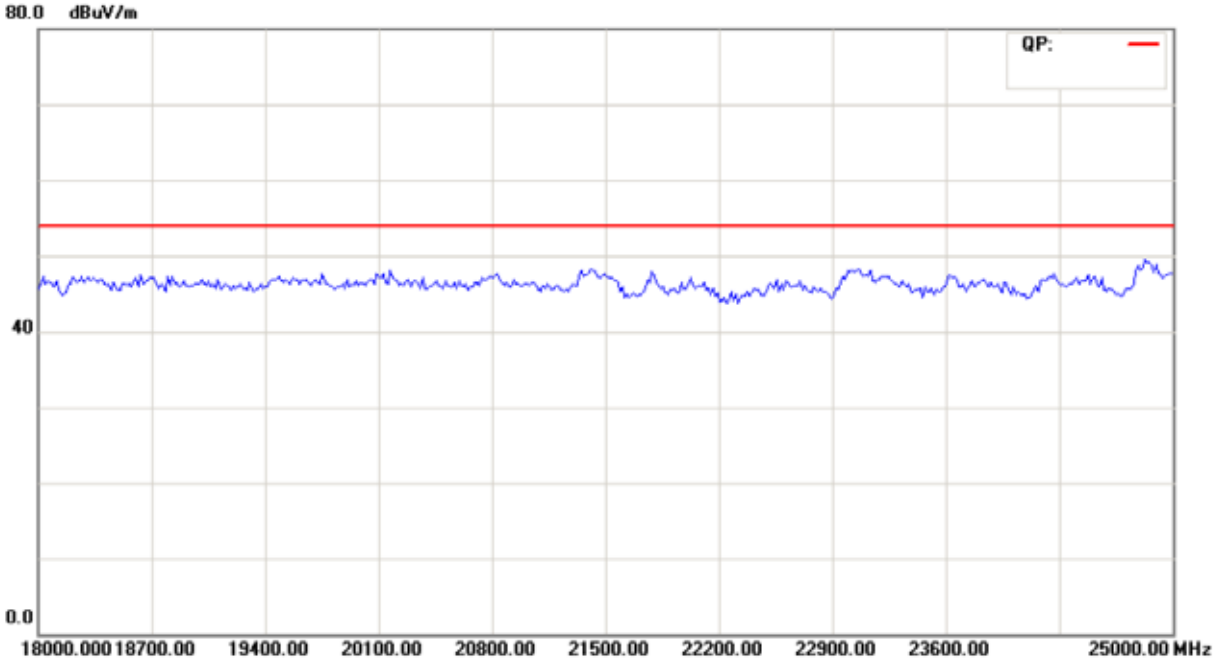
**18-25G**

**CH High Horizontal**




**18-25G**

**CH High Vertical**



## 7.0 20dB Bandwidth Measurement

### 7.1 Regulation

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### 7.2 Limits of 20dB Bandwidth Measurement

**N/A**

### 7.3 Test Procedure.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.

2. Set the spectrum analyzer as follows: Span =5MHz, VBW = RBW=100kHz, Sweep = auto Detector function = peak, Trace = max hold

3. Measure the highest amplitude appearing on spectral display and record the level to calculate results. 6. Repeat above procedures until all frequencies measured were complete.

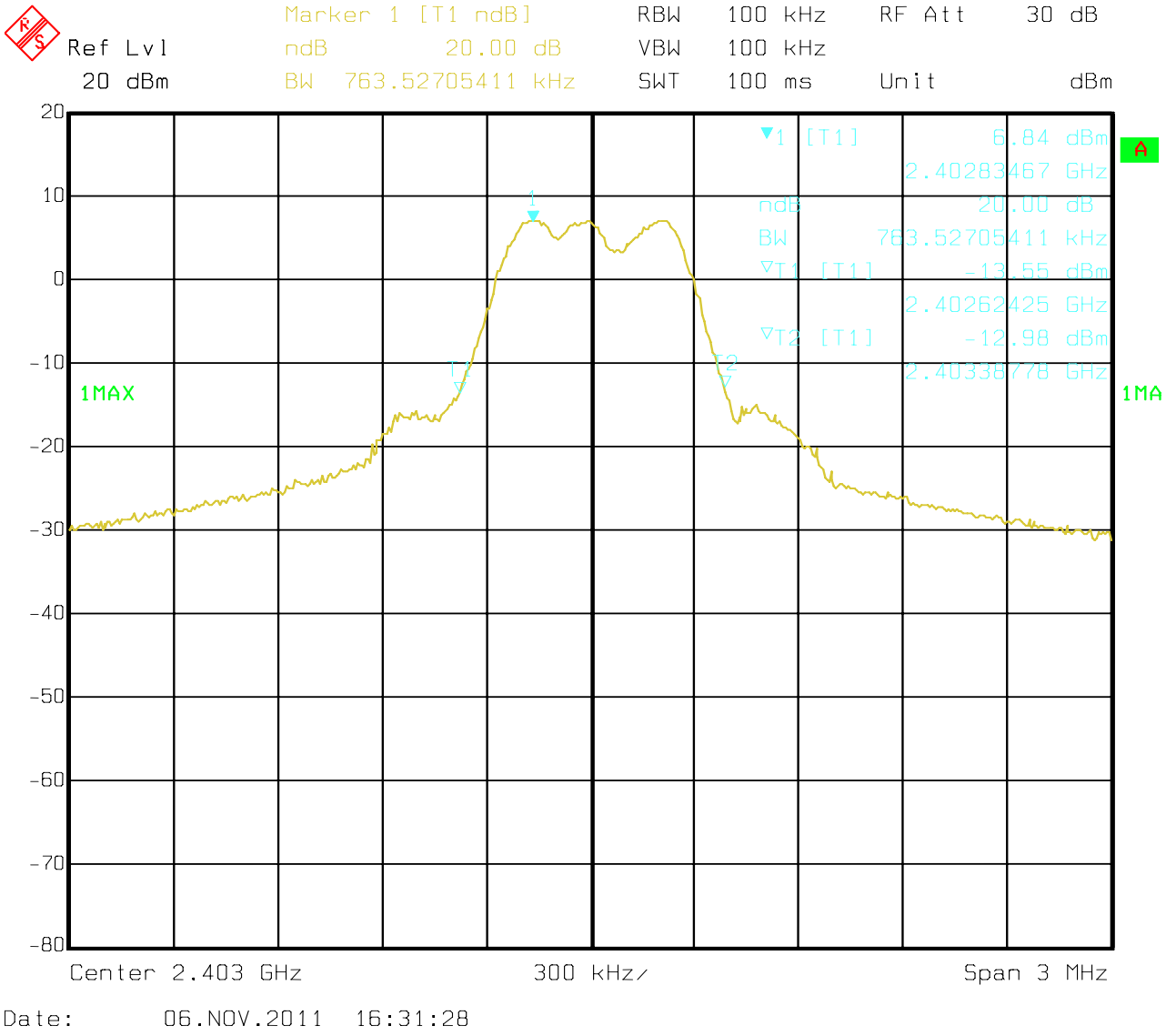
### 7.4 Test Result

| EUT | outdoor highspeed coax helicopter | Model | Radio control(X5) |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC 6V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

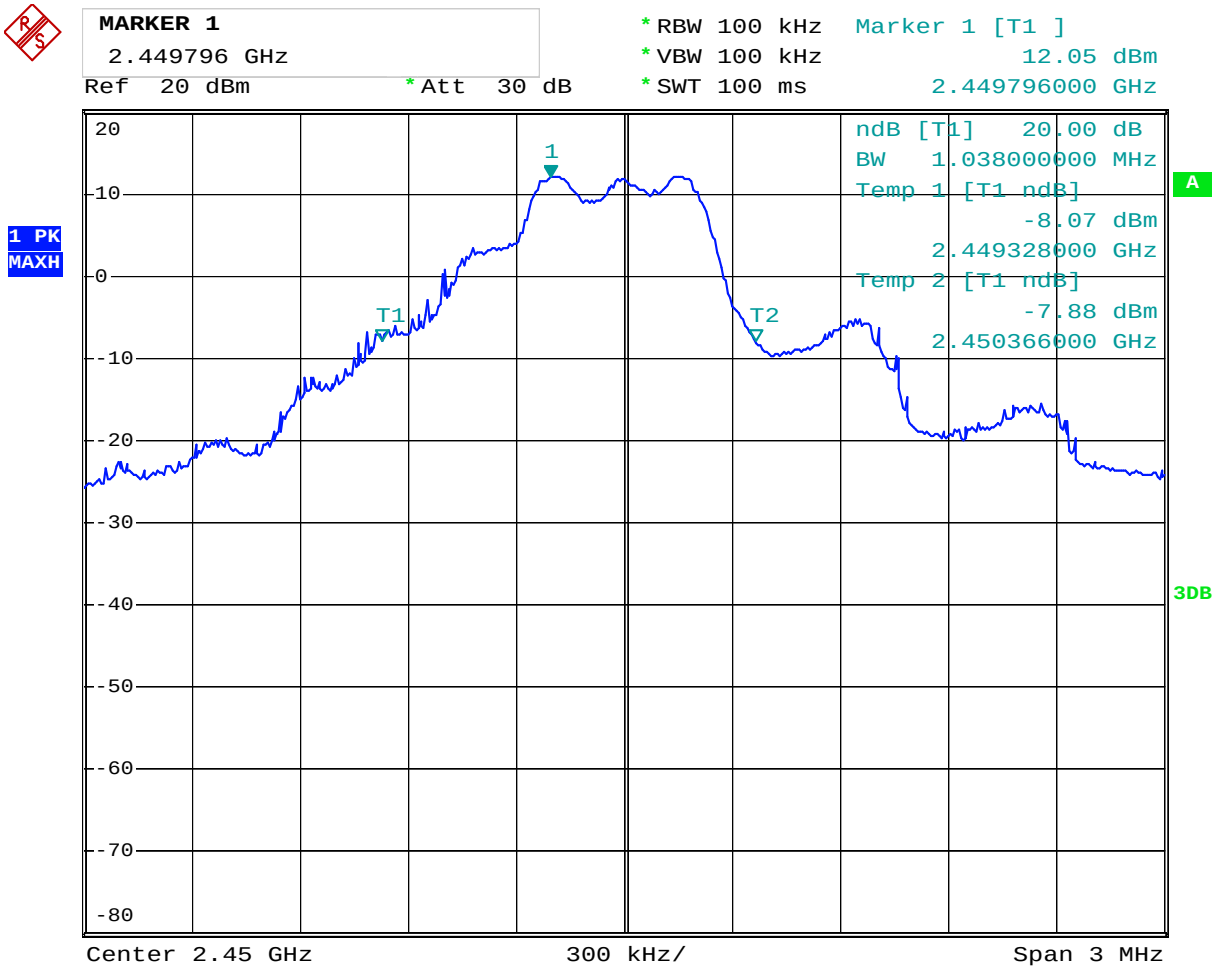
| Channel | Channel Frequency (MHz) | 20 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/ Fail |
|---|---|---|---|---|
| Low | 2403 | 0.763 | -- | Pass |
| Mid | 2450 | 1.038 | -- | Pass |
| High | 2478 | 0.788 | -- | Pass |

**Test Plots:**

**1. CH Low**



## 2. CH Mid

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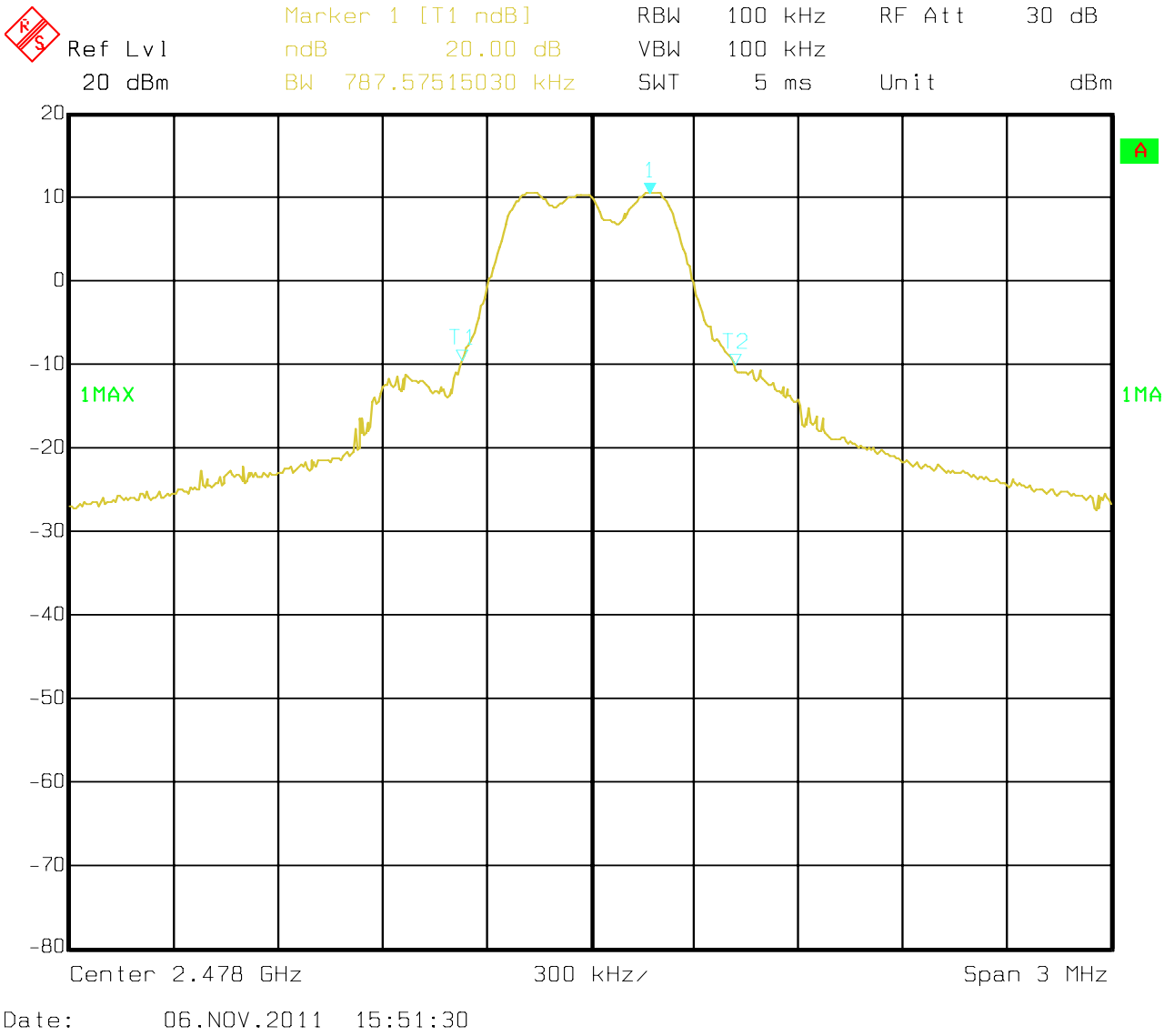
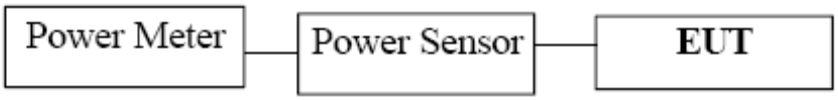
**3. CH High**



## 8. Maximum Peak Output Power

### 8.1 Test Setup




### 8.2 Limits of Maximum Peak Output Power

The Maximum Peak Output Power Measurement is 30dBm.

### 8.3 Test Procedure

The RF power output was measured with a Power meter connected to the RF Antenna connector ( conducted measurement ) while EUT was operating in transmit mode at the appropriate centre frequency.

### 8.4Test Results

| EUT | outdoor highspeed coax helicopter | Model | Radio control(X5) |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC 6V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Channel Frequency (MHz) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Pass/ Fail |
|---|---|---|---|---|
| Low | 2403 | 12.1 | 30 | Pass |
| Mid | 2450 | 15.2 | 30 | Pass |
| High | 2478 | 13.5 | 30 | Pass |

Note: 1. At finial test to get the worst-case emission for CH Low, CH Mid and CH High

2. The result basic equation calculation as follow:

Peak Power Output = Peak Power Reading + Cable loss + Attenuator

# 9. Carrier Frequency Separation

## 9.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

## 9.2 Limits of Carrier Frequency Separation

The Maximum Power Spectral Density Measurement is 25kHz or two-thirds of the 20dB bandwidth of the hopping Channel which is great.

## 9.3 Test Procedure

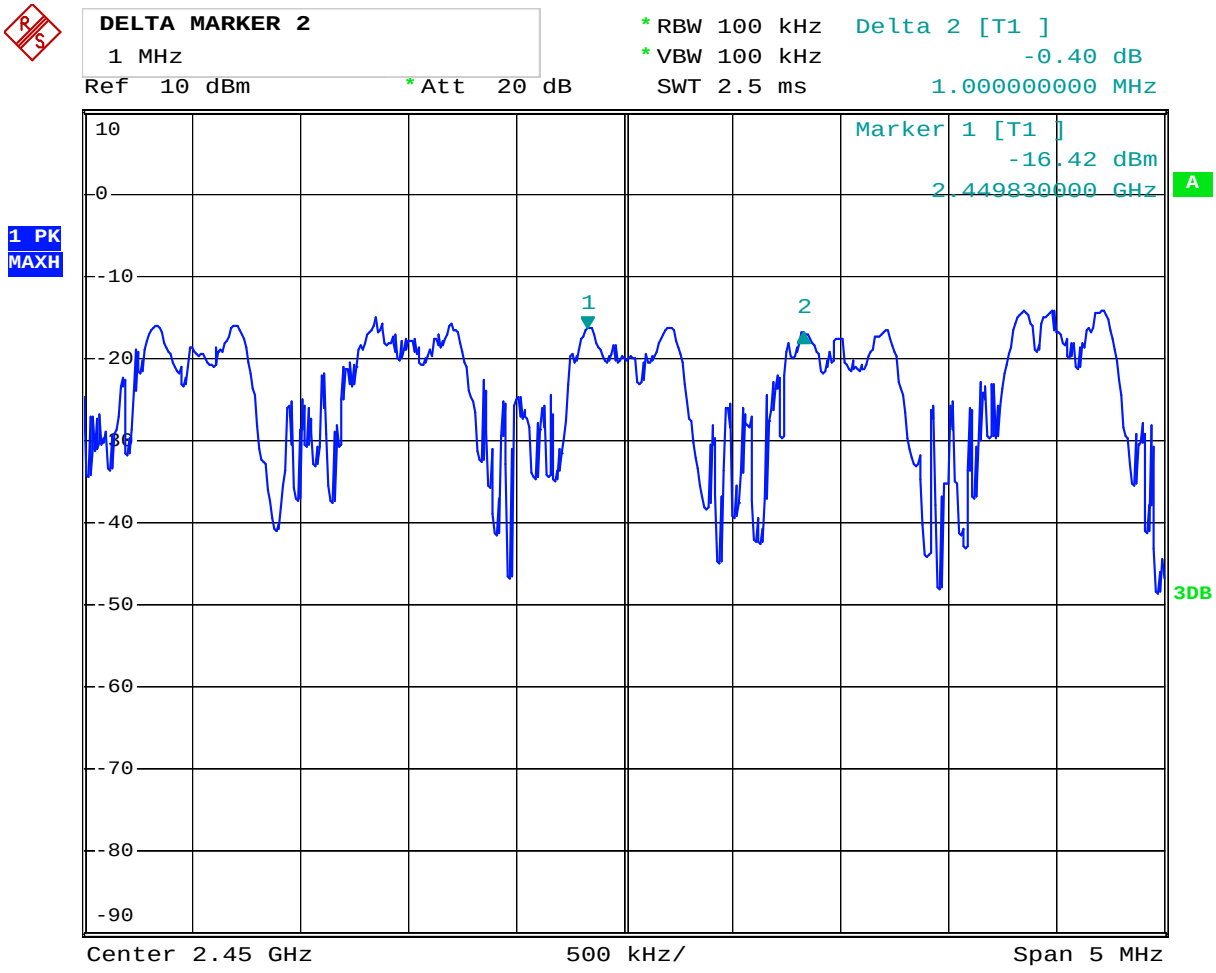
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels: Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span; Video (or Average) Bandwidth (VBW) ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold
3. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.

## 9.4Test Result

| EUT | outdoor highspeed coax helicopter | Model | Radio control(X5) |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC 6V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Channel Frequency (MHz) | Carrier Frequency Separation | Limit | Pass/ Fail |
|---|---|---|---|---|
| Middle | 2450 | 1MHz | ≥ 25 kHz or 20 dB bandwidth | Pass |

**Test Plot:**

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## 10. Number of Hopping Channels

### 10.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 10.2 Limits of Number of Hopping Channels

The frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

### 10.3 Test Procedure

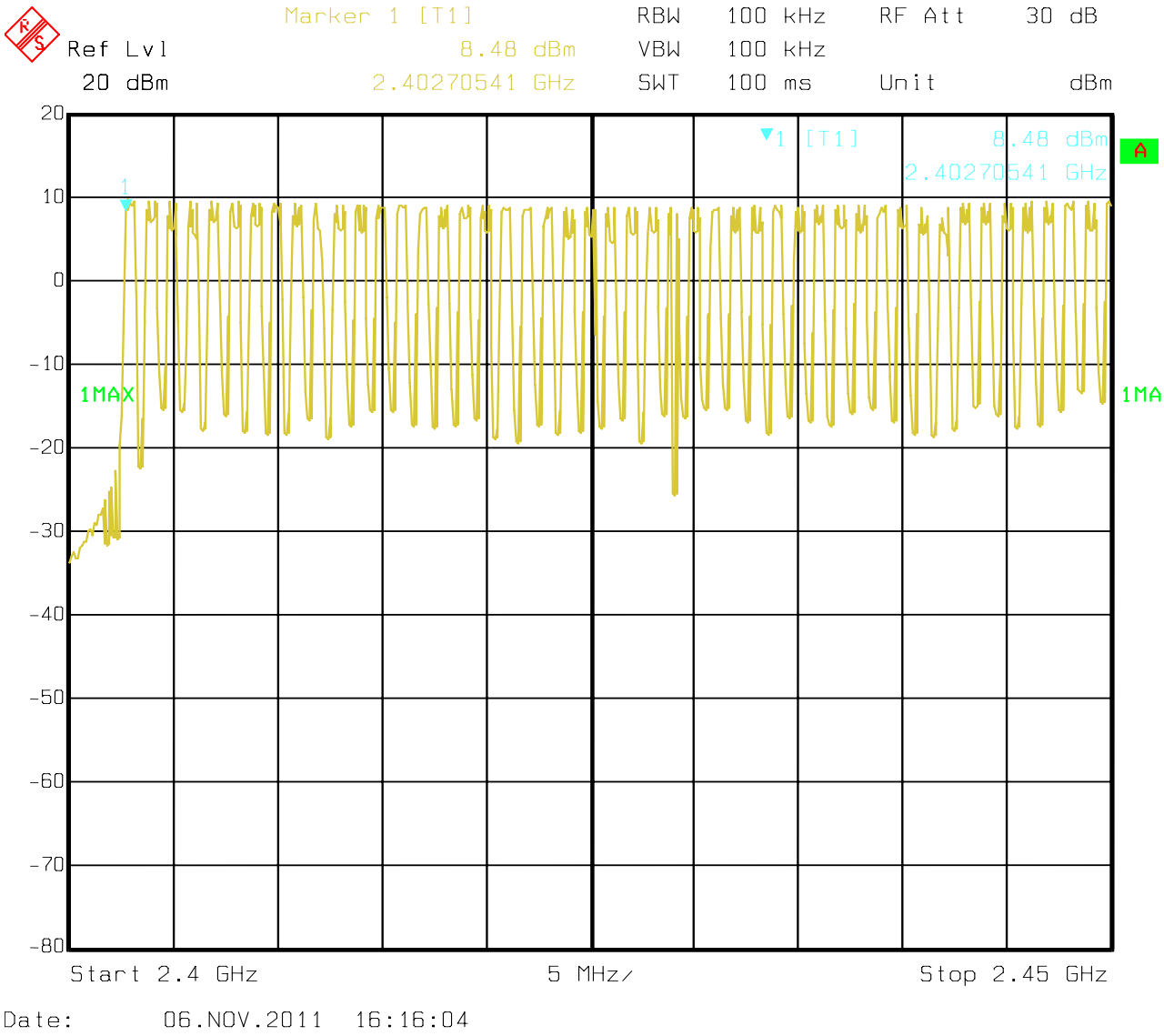
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW ≥ 1% of the span; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold
3. Record the number of hopping channels.

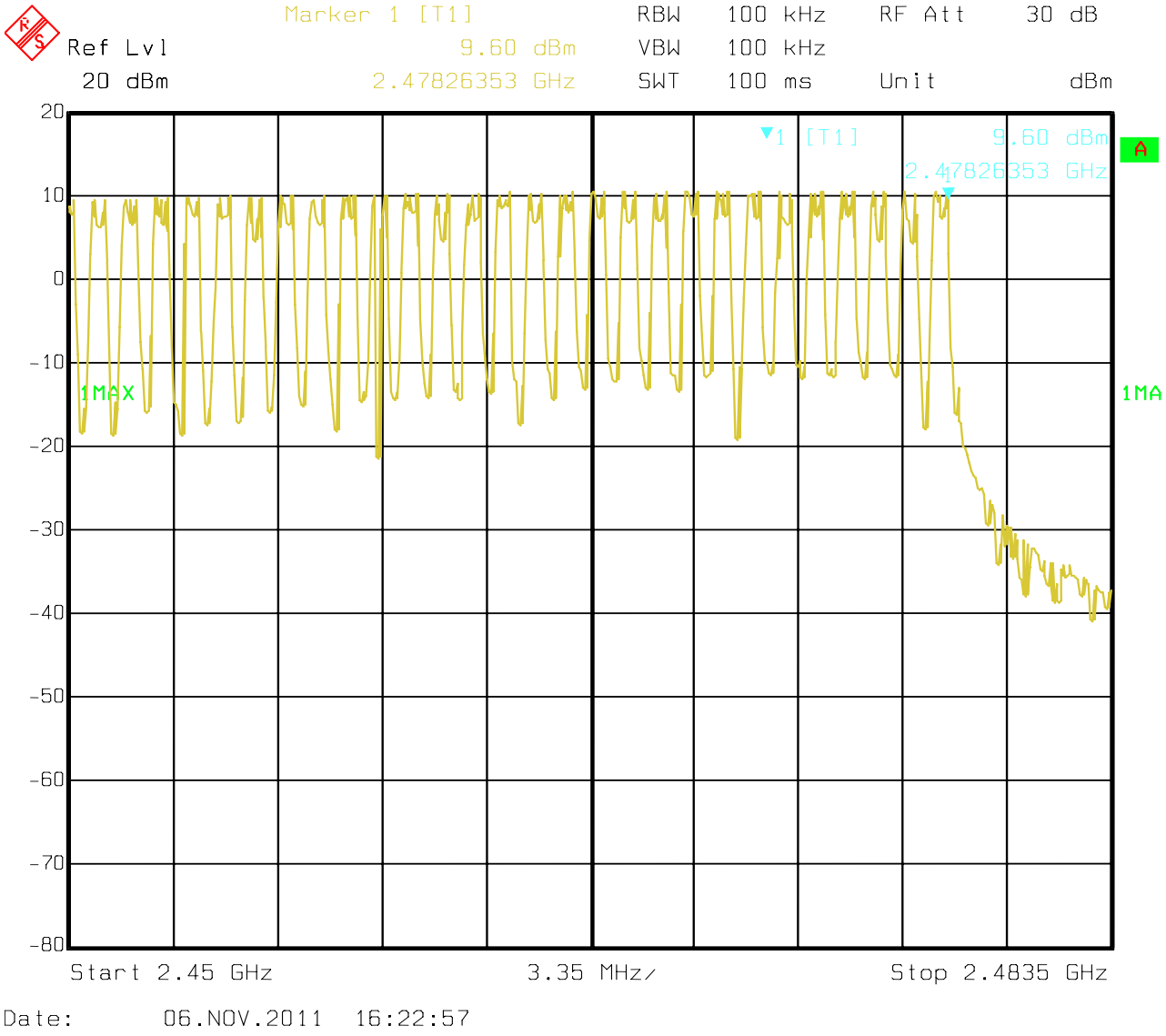
### 10.4Test Result

| EUT | outdoor highspeed coax helicopter | Model | Radio control(X5) |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC 6V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Operating Frequency | Number of hopping channels | Limit | Pass/ Fail |
|---|---|---|---|
| 2403-2478MHz | 76 | ≥ 15 | Pass |

## Test Plots





## 11. Time of Occupancy (Dewell Time)

### 11.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 11.2 Limits of Carrier Frequency Separation

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed

### 11.3 Test Procedure

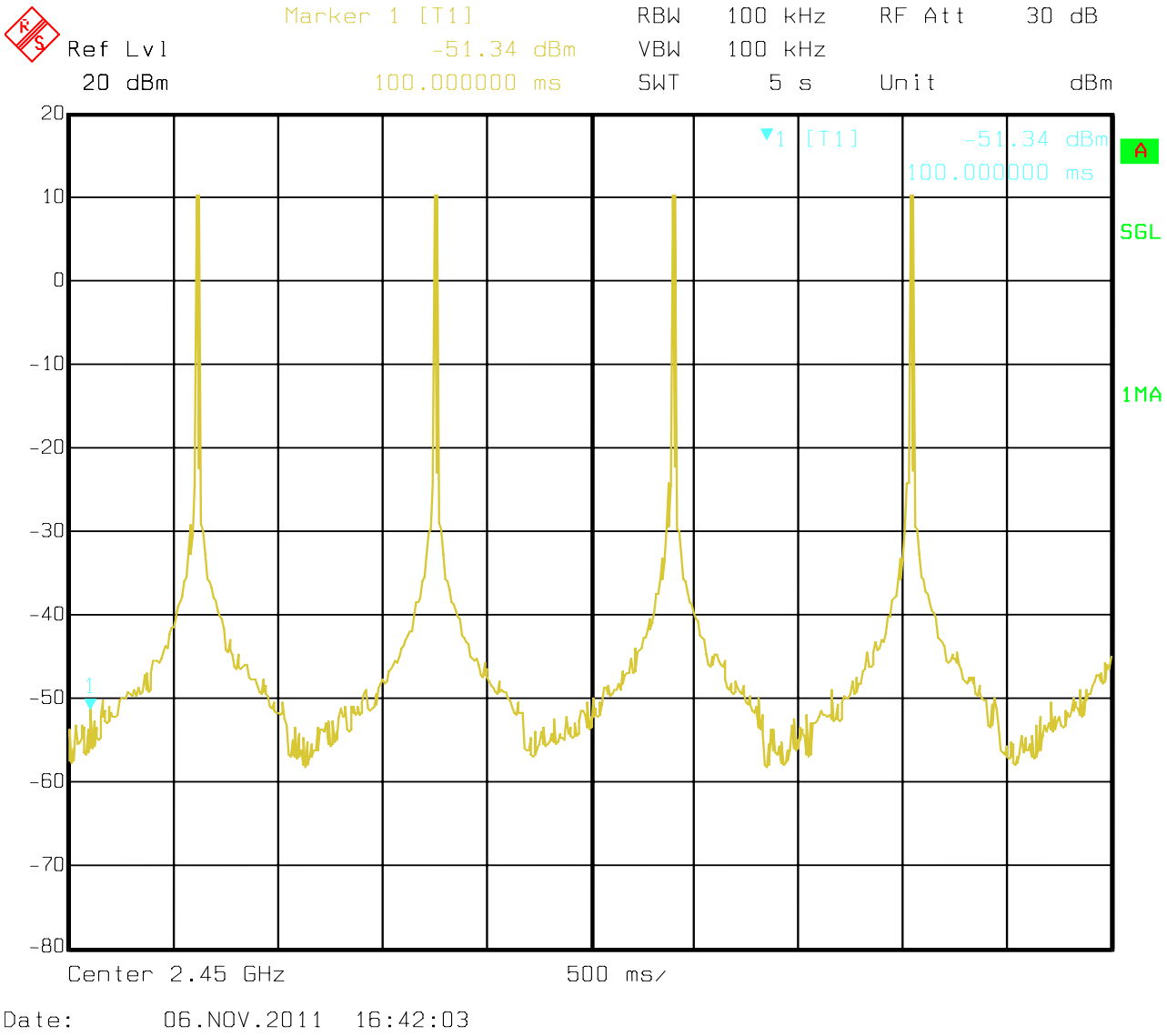
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold
3. Measure the dwell time using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.
5. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

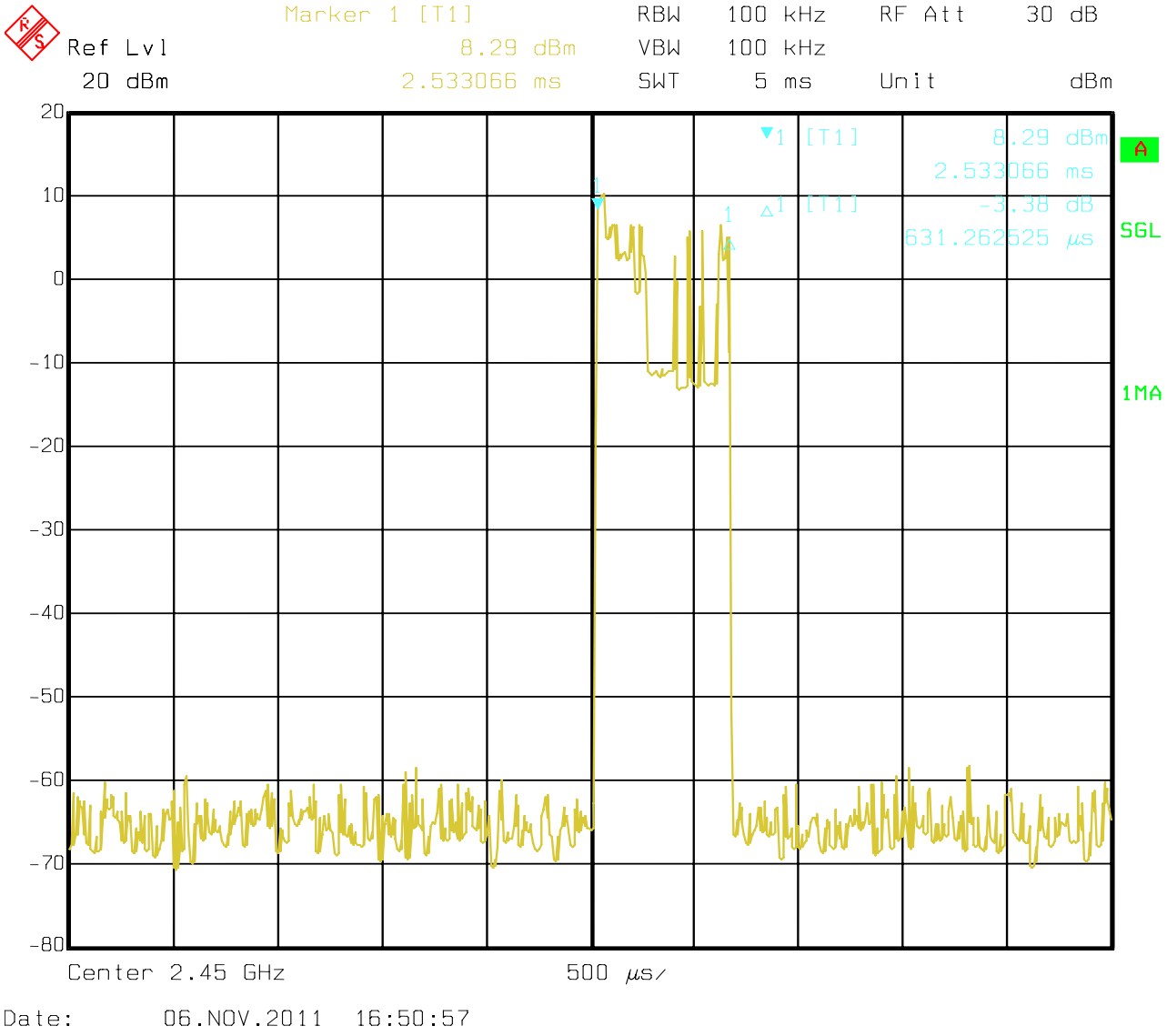
| EUT | outdoor highspeed coax helicopter | Model | Radio control(X5) |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC 6V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

| Channel | Actual | Limit |
|---|---|---|
| Middle | 0.015s | 0.4s |

Actual = (0.4 × 76 / 5) × 0.631 × 4 = 15ms

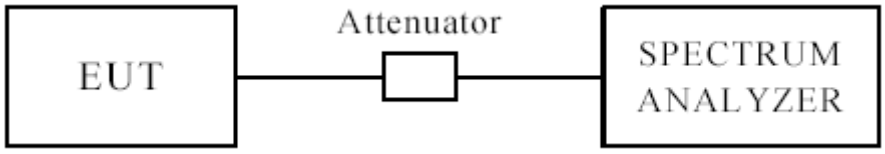
**Test Plots**





# 12 Out of Band Measurement

## 12.1 Test Setup




## 12.2 Limits of Out of Band Emissions Measurement

1. Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209

## 12.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was applied to the average and peak filed strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

The spectrum plots (Peak RBW=VBW=1MHz; Average RBW=1MHz, VBW=10Hz) are attached on the following pages.

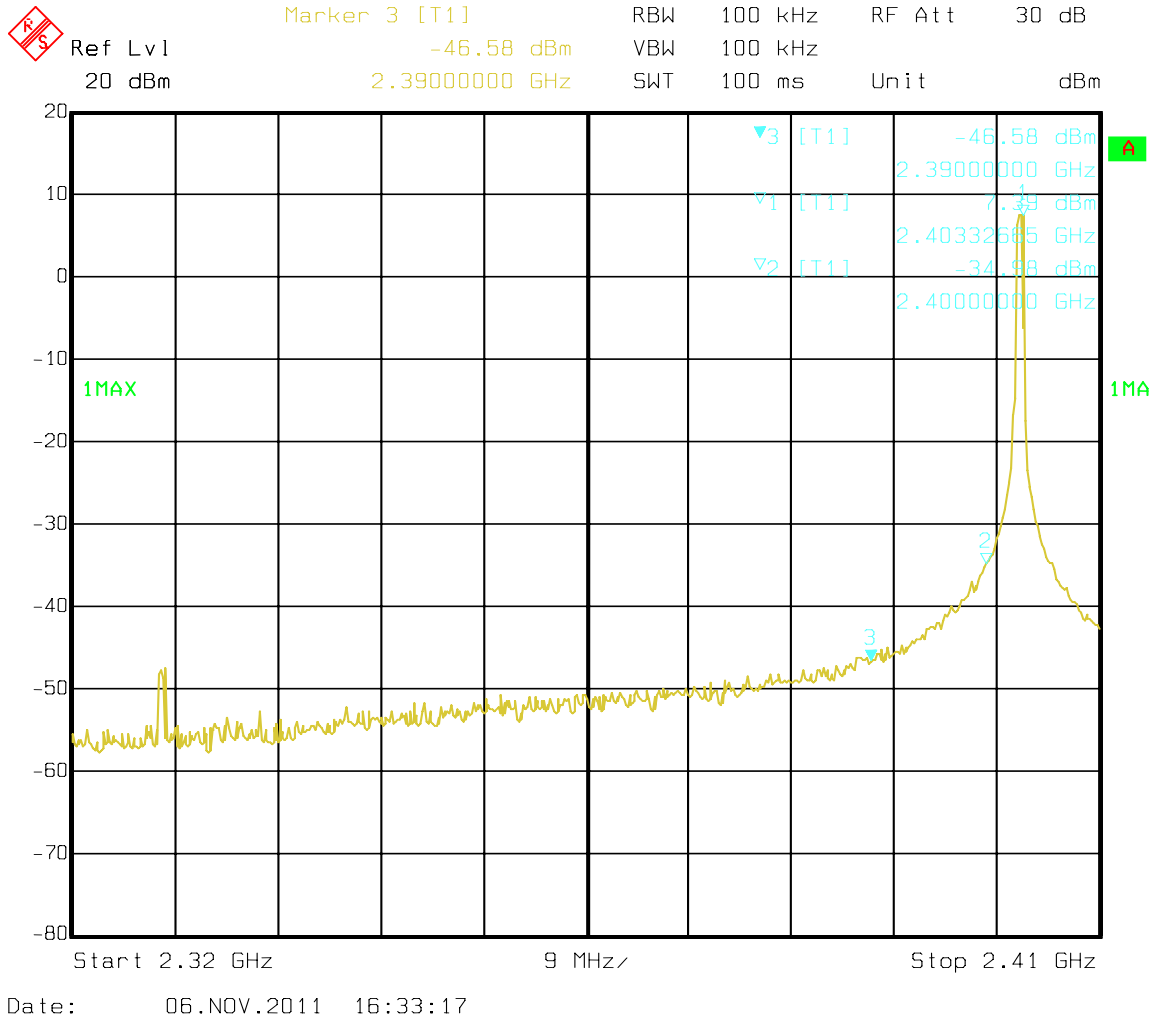
**12.4Test Result**

CH Low

**12.4** Out of Band Test Result

| Product: | outdoor highspeed coax helicopter | | Test Mode: | CH Low |
|---|---|---|---|---|
| Mode | Keep Transmitting | | Input Voltage | DC 6V |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| The Max. FS in Restrict Band | PK (dBμV/m) | 44.1(V)/40.2(H) | Limit | 74(dBμV/m) |
| | AV(dBμV/m) | 32.9(V)/30.6(H) | | 54(dBμV/m) |

**Test Figure:**




**Note: 1. The Max. FS in Restrict Band are measured in conventional method.**

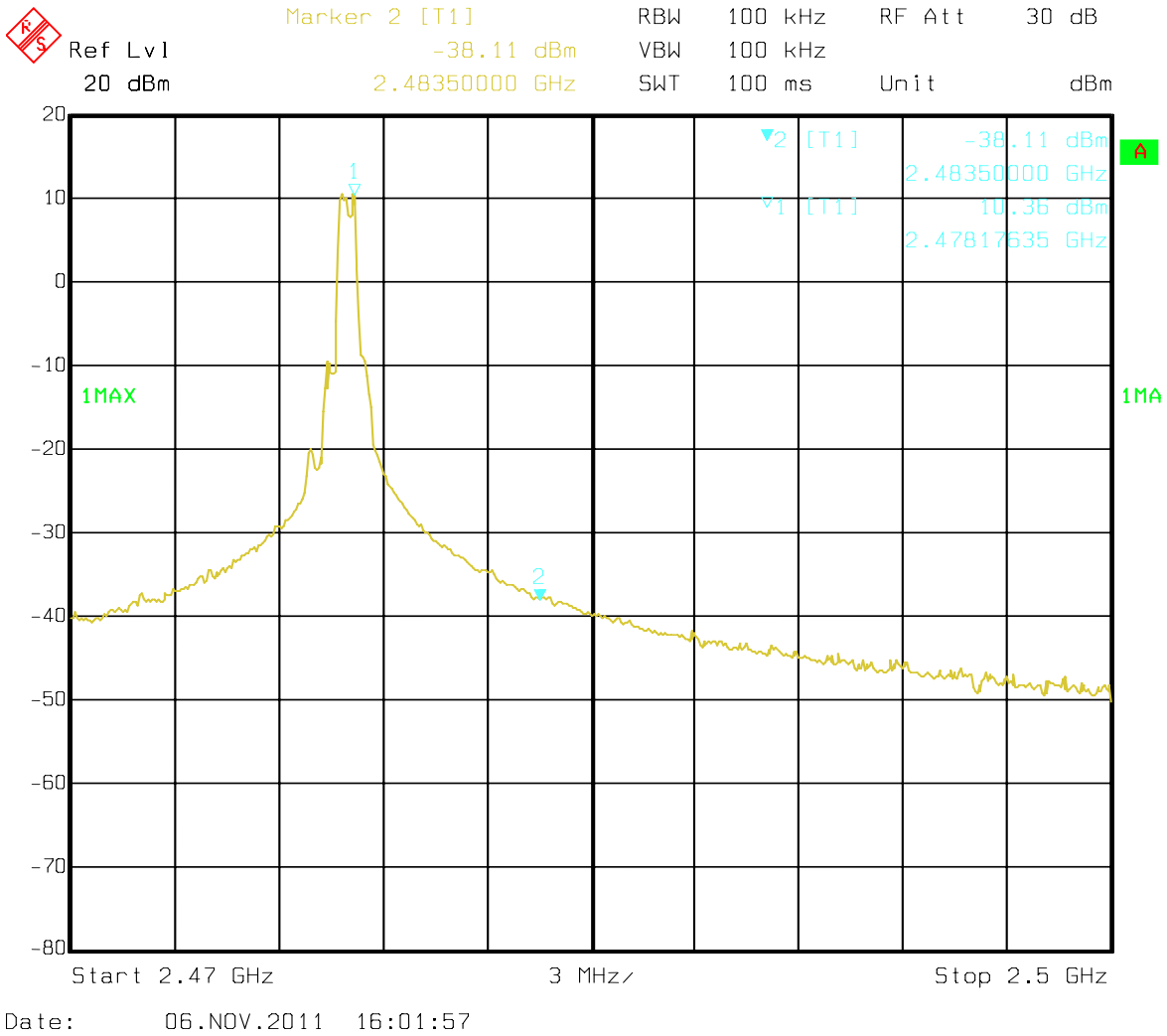
**2. Final Level = Reading + AF + Cable - Preamp**

CH High

**12.4** Out of Band Test Result

| Product: | outdoor highspeed coax helicopter | | Test Mode: | CH High |
|---|---|---|---|---|
| Mode | Keep Transmitting | | Input Voltage | DC 6V |
| Temperature | 24 deg. C, | | Humidity | 56% RH |
| Test Result: | Pass | | Detector | PK |
| The Max. FS in Restrict Band | PK (dBμV/m) | 57.5(V)/53.2(H) | Limit | 74(dBμV/m) |
| | AV(dBμV/m) | 46.7(V)/41.8(H) | | 54(dBμV/m) |

**Test Figure:**




**Note: 1. The Max. FS in Restrict Band are measured in conventional method.**

**2. Final Level = Reading + AF + Cable - Preamp**

## 13.0 Antenna Requirement

### 13.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

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

### 13.2 Antenna Connected construction

The antenna is PCB Print antenna. The maximum Gain of this antenna is 4.0dBi

## 14.0 Maximum Permissible Exposure

**Applicable Standard**

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

(a) Limits for Occupational / Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) ($mW/cm^2$) | Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes) |
|---|---|---|---|---|
| 0.3-3.0 | 614 | 1.63 | (100)* | 6 |
| 3.0-30 | 1842/f | 4.89/f | (900/f)* | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | | | F/300 | 6 |
| 1500-100000 | | | 5 | 6 |

(b) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) ($mW/cm^2$) | Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes) |
|---|---|---|---|---|
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | | | F/1500 | 30 |
| 1500-100000 | | | 1.0 | 30 |

Note: f=frequency in MHz; *Plane-wave equivalent power density

**MPE Calculation Method**

E (V/m) = $(30*P*G)^{0.5}/d$ Power Density: Pd ($W/m^2$) = $E^2/377$

**E** = Electric Field (V/m)

**P** = Peak RF output Power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

**Pd** = $(30*P*G) / (377*d^2)$

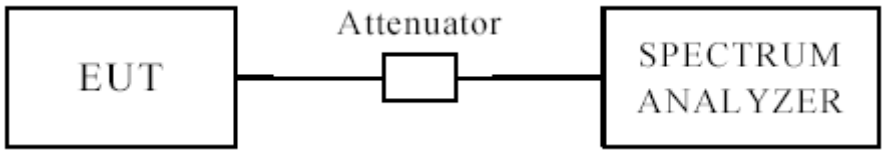
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

**Calculated Result and Limit**

| Antenna Gain (Numeric) | Peak Output Power (dBm) | Peak Output Power (mW) | Power Density (S) ($mW/cm^2$) | Limit of Power Density (S) ($mW/cm^2$) | Test Result |
|---|---|---|---|---|---|
| 2.512 | 15.20 | 33.11 | 0.165 | 1 | Compiles |

## 15. 99% Bandwidth Measurement

### Test Setup




### Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator.

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 300 kHz VBW. Then use the 99% Occupied Bandwidth function of the analyzer to measure. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

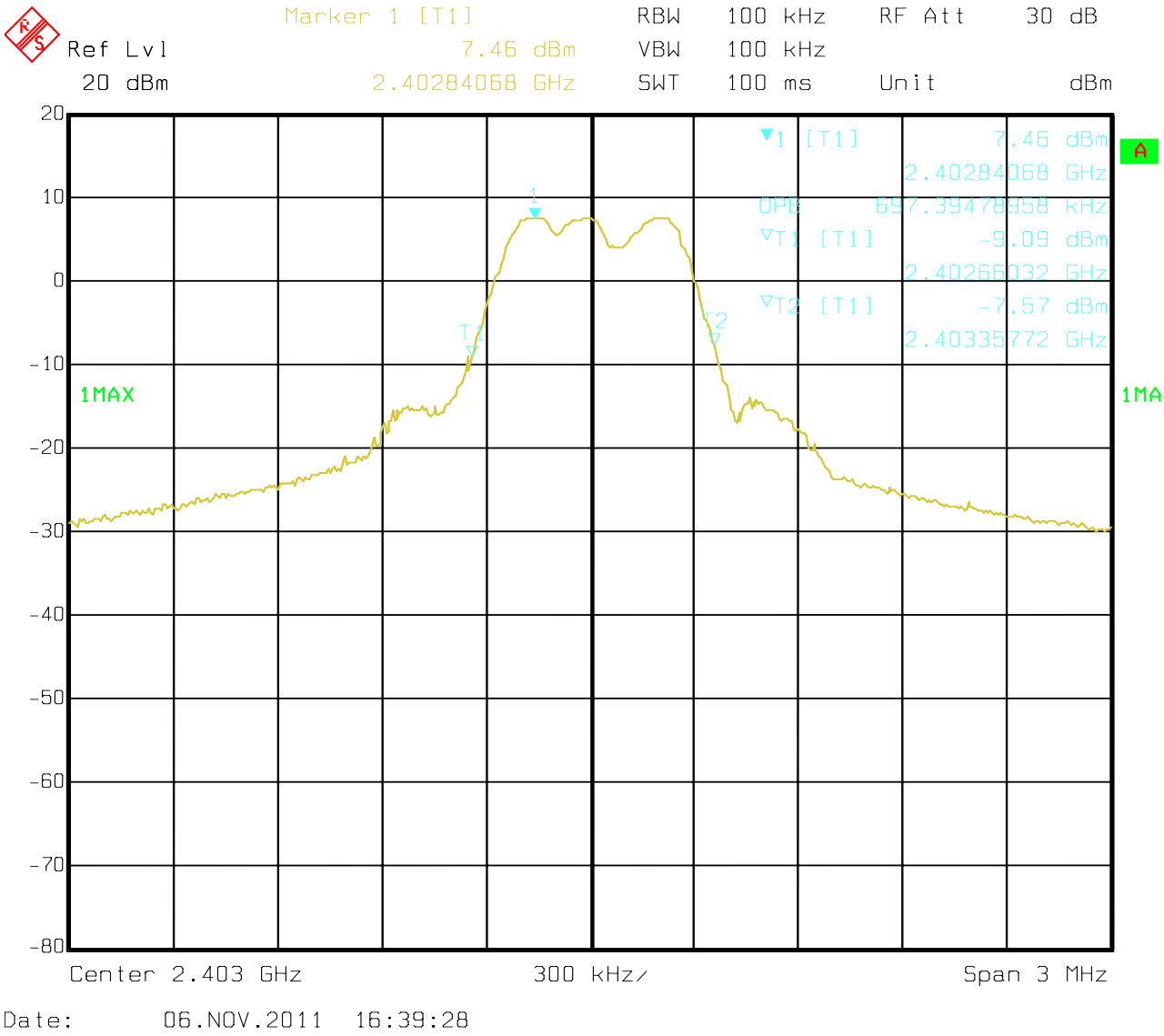
### Test Result

| EUT | outdoor highspeed coax helicopter | Model | Radio control(X5) |
|---|---|---|---|
| Mode | Keep Transmitting | Input Voltage | DC 6V |
| Temperature | 24 deg. C, | Humidity | 56% RH |

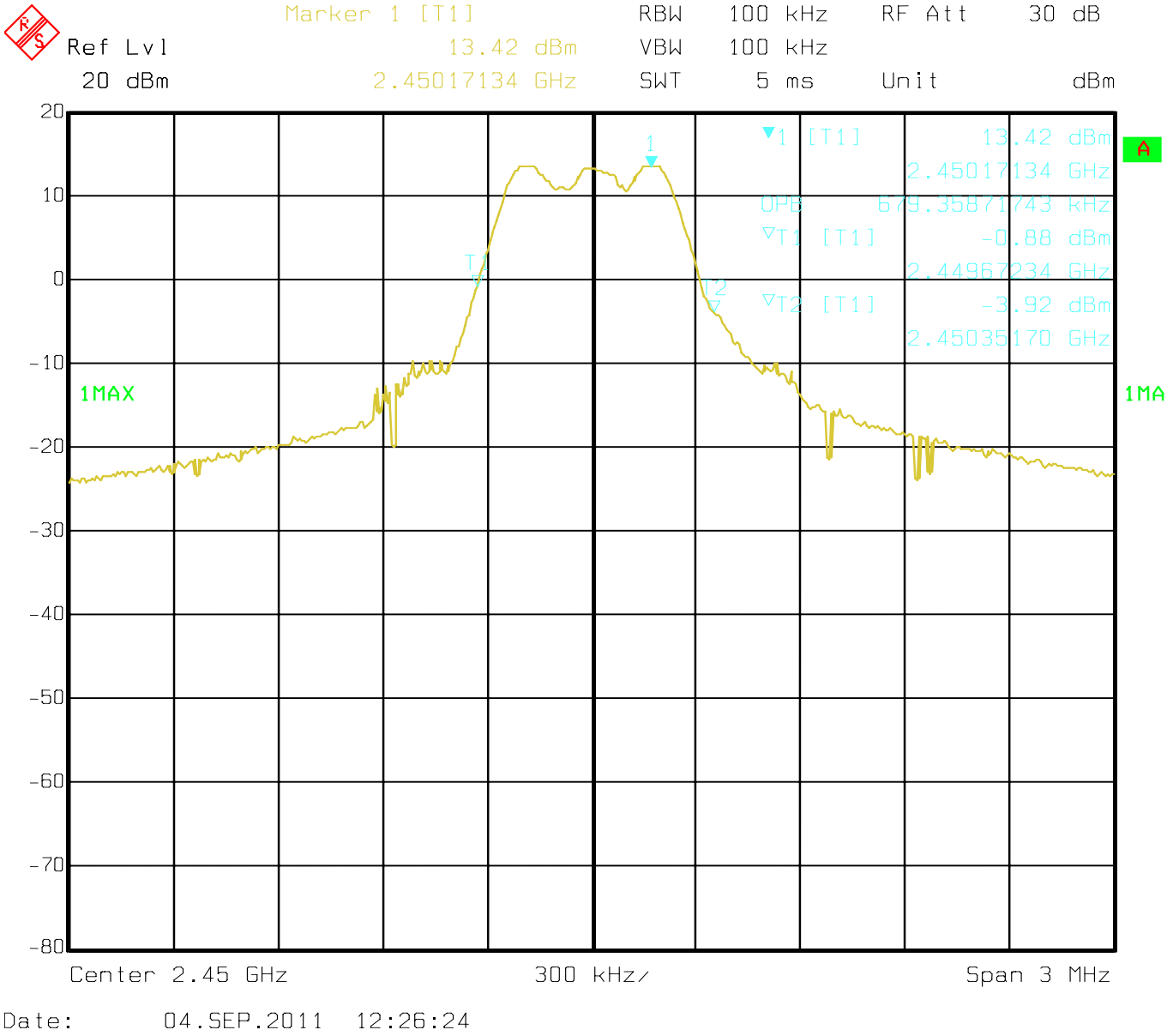
| Channel | Channel Frequency (MHz) | 99% Bandwidth (MHz) | Minimum Limit (MHz) | Pass/ Fail |
|---|---|---|---|---|
| Low | 2403 | 697 | -- | Pass |
| Mid | 2450 | 679 | -- | Pass |
| High | 2478 | 709 | -- | Pass |

**Test Plots**

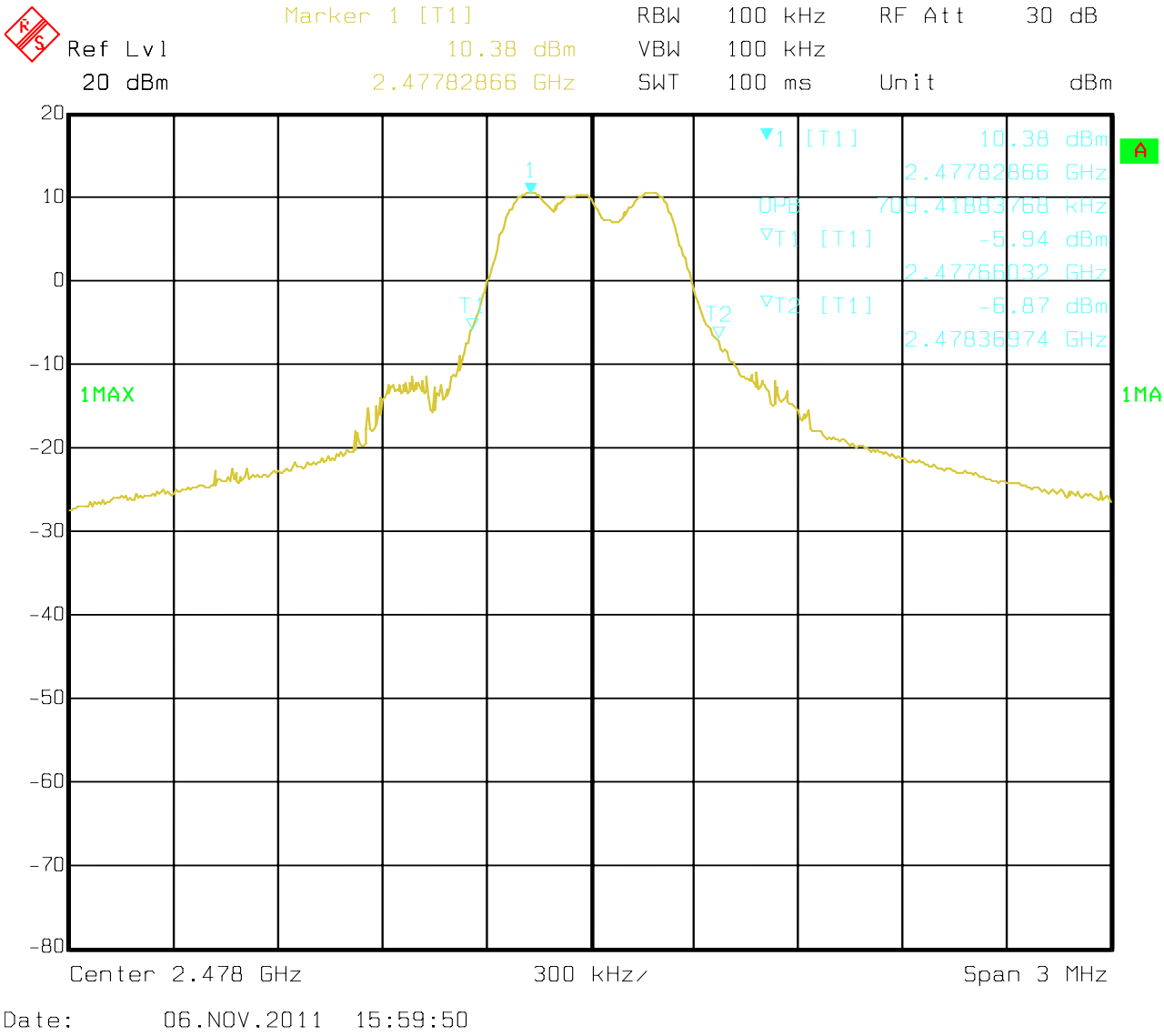
1.CH Low



1.CH Mid



1.CH High



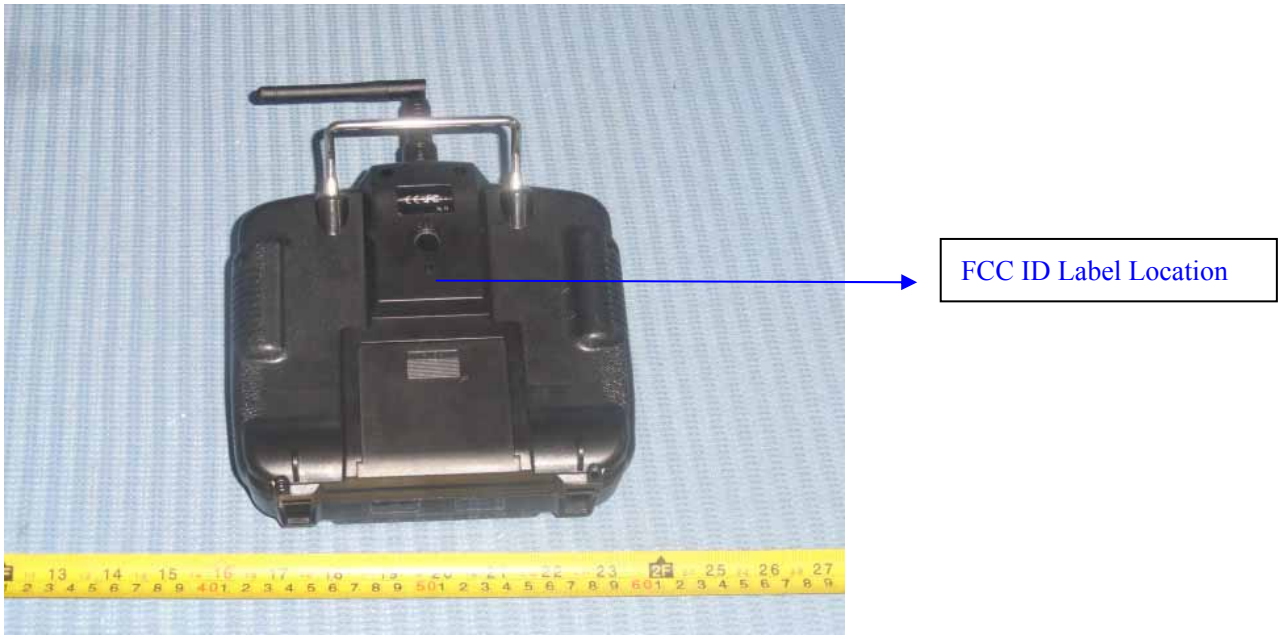
## 16.0 FCC ID Label

**FCC ID: ZYOX350**

**This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

**Mark Location:**



## 17.0 Photo of testing

17.1 Emission Radiated test View--

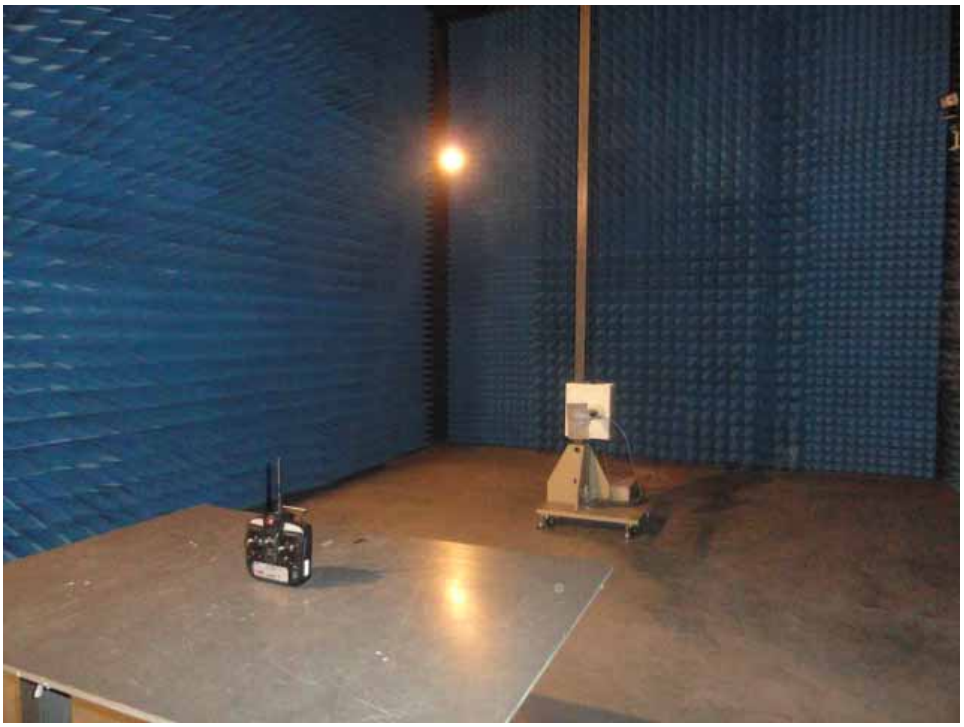
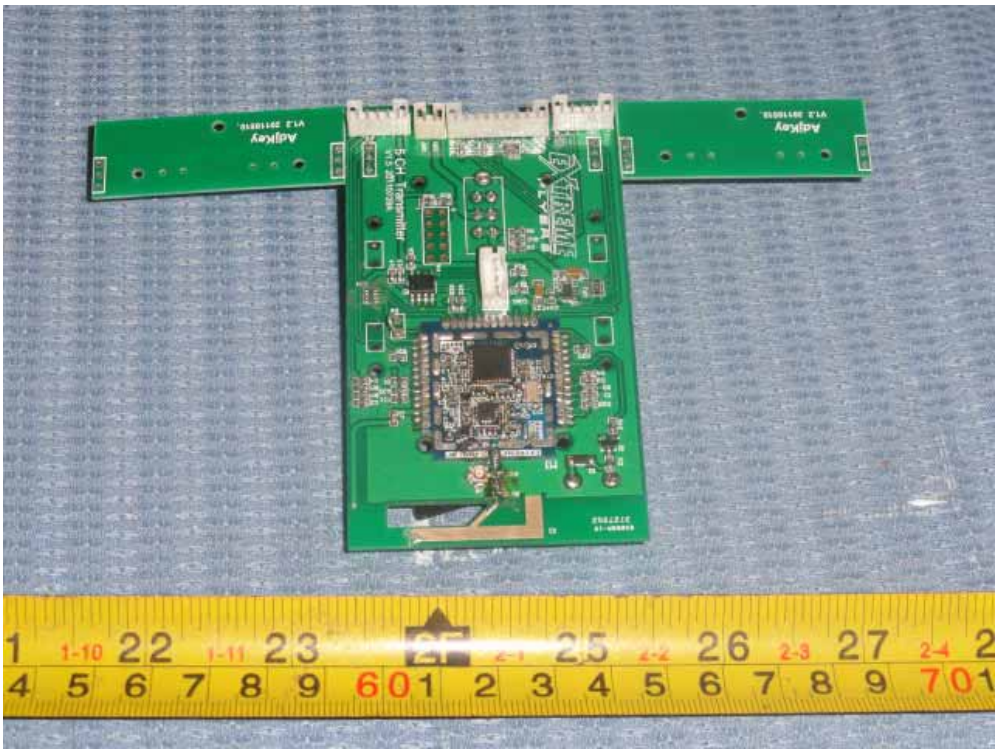


Photo for the EUT

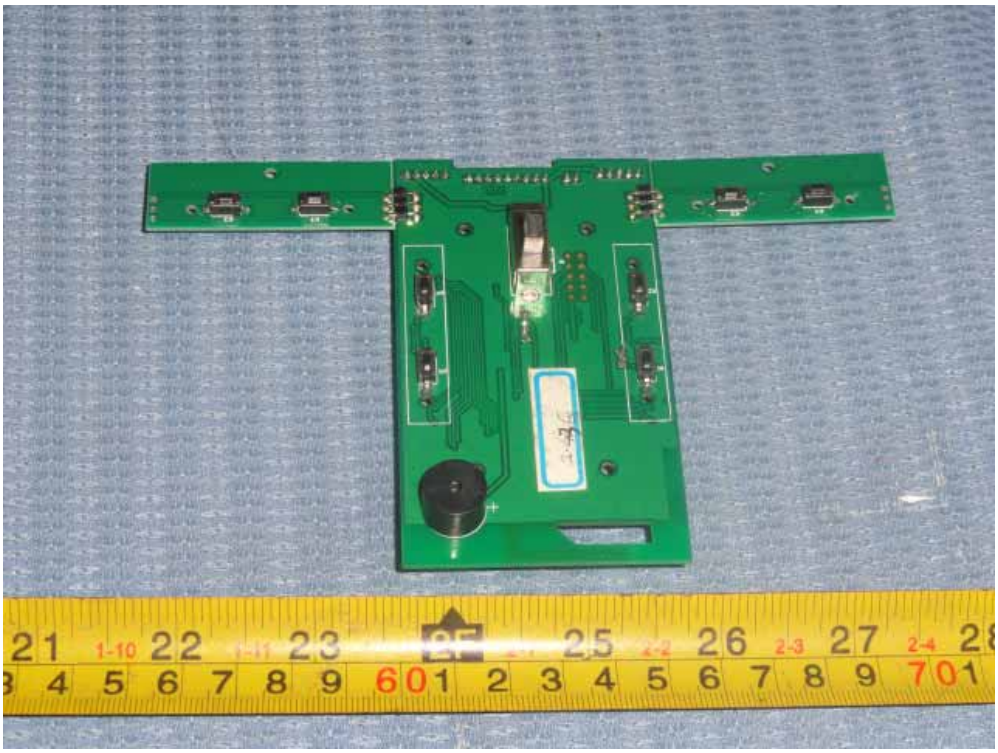
Outside View

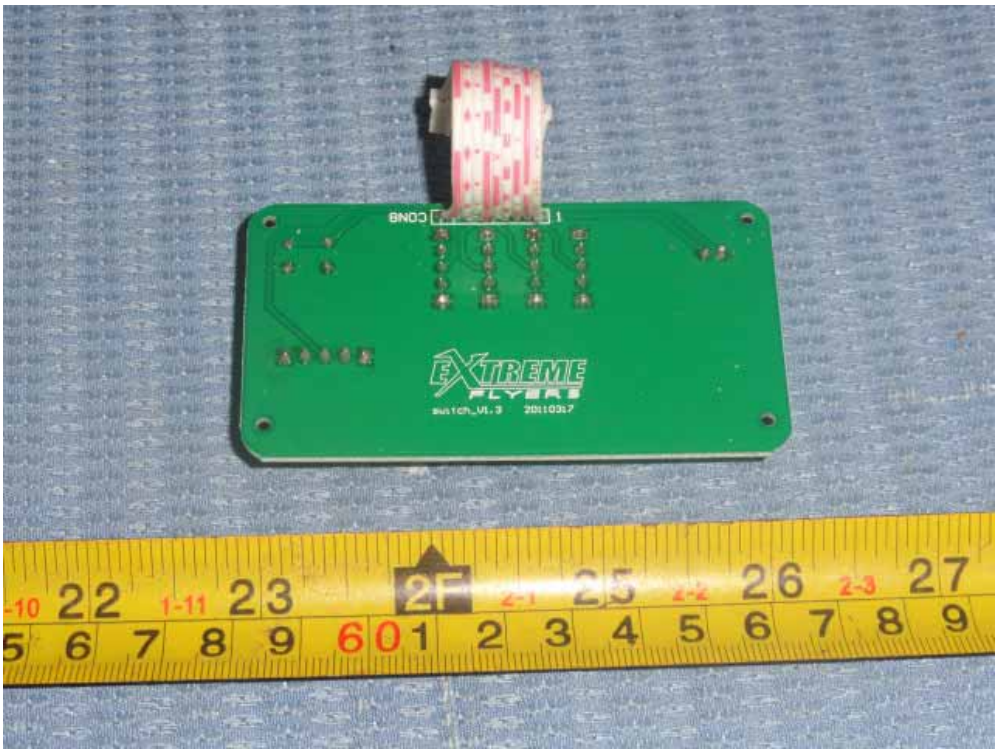

Interior View

Interior View

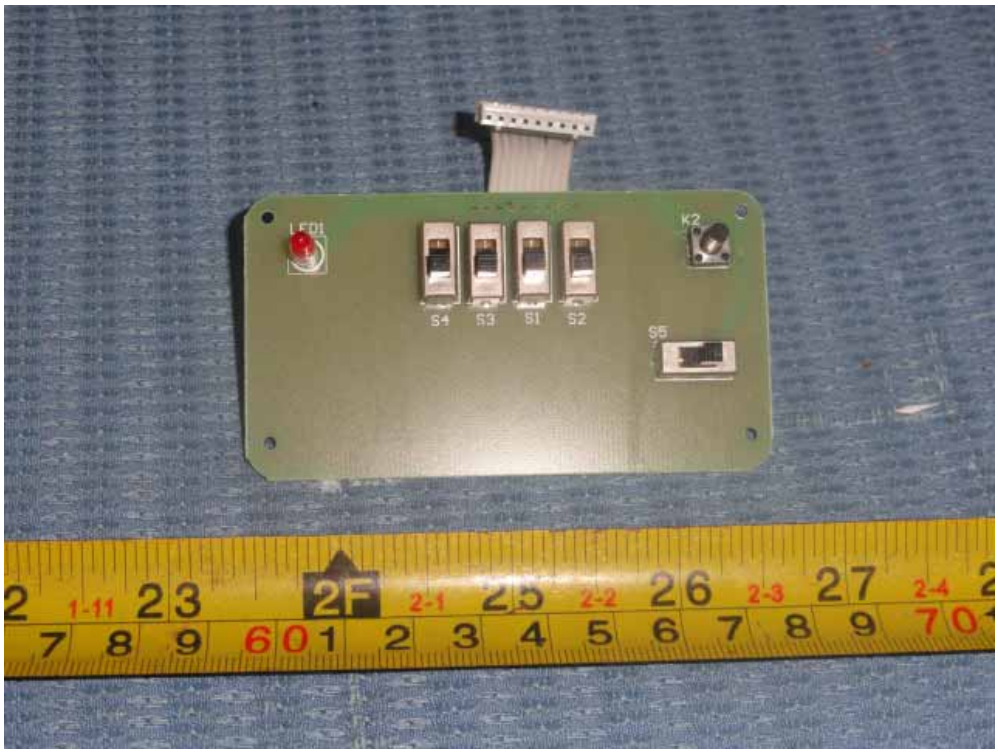


Interior View





Interior View




Interior View


**End of the report**