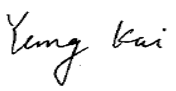


<b>Prüfbericht - Nr.: 18000211 001</b> <i>Test Report No.:</i>			<b>Seite 1 von 23</b> <i>Page 1 of 23</i>		
<b>Auftraggeber:</b> <i>Client:</i>			<b>Beijing Hailin Electric Equipment Co., Ltd</b> Shahe Industrial Zone, Changping District, Beijing 102206 P.R.China		
<b>Gegenstand der Prüfung: Wireless Thermostat</b> <i>Test item:</i>					
<b>Bezeichnung:</b> <i>Identification:</i>		<b>A3900</b>		<b>Serien-Nr.:</b> <i>Serial No.:</i>	
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>		<b>1143001493</b>		<b>Eingangsdatum:</b> <i>Date of receipt:</i>	
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>		<b>1143001493</b>		<b>2009-07-03</b>	
<b>Prüfart:</b> <i>Testing location:</i>			<b>Refer to section 1.1</b>		
<b>Prüfgrundlage:</b> <i>Test specification:</i>			<b>FCC Part 15 Subpart C: 2009</b>		
<b>Prüfresultat:</b> <i>Test Result:</i>			<b>Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).</b> <i>The test items passed the test specification(s).</i>		
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>			<b>Refer to section 1.1</b>		
<div style="display: flex; justify-content: space-between;"> <span><b>geprüft/ tested by:</b></span> <span><b>kontrolliert/ reviewed by:</b></span> </div>					
2010-12-22    Yang, Kai/PE				2010-12-22    Sun, Lixun/TC	
<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>
<b>Sonstiges/ Other Aspects:</b>					
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <b>Abkürzungen:</b>            P(ass) = entspricht Prüfgrundlage            F(ail) = entspricht nicht Prüfgrundlage            N/A = nicht anwendbar            N/T = nicht getestet         </div> <div style="width: 45%;"> <b>Abbreviations:</b>            P(ass) = passed            F(ail) = failed            N/A = not applicable            N/T = not tested         </div> </div>					

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## TEST SUMMARY

4.1.1 SECTION 15.203 ANTENNA REQUIREMENT

*Result:*

*Passed*

4.1.2 SECTION 15.231 (C) 20dB BANDWIDTH TESTING

*Result:*

*Passed*

4.1.3 SECTION 15.205, SECTION 15.209, SECTION 15.231 (B) RADIATED EMISSION

*Result:*

*Passed*

4.1.4 SECTION 15.231 (A) LIMITING OPERATIONS AND DURATION OF TRANSMISSION

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# 1 Test Sites

## 1.1 Test Facilities

**Laboratory: Audix Technology (Shenzhen) Co., Ltd. (2.948 listed)**

**Address: No.6 Ke Feng Road, Block 52, Shenzhen Science & Industry park Nantou, Shenzhen, Guangdong, China**

The used test equipment is in accordance with CISPR 16-1 for measurement of radio interference.

## 1.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

No.	Equipment	Model	Serial no. / Inventory no.	Manufacturer	Cal. due date
1	Spectrum Analyzer	E4446A	US4430045 9	Agilent	2011-05-08
2	Amplifier	8447D	2944A1115 9	Agilent	2011-05-08
3	Amplifier	8449B	3008A0249 5	Agilent	2011-05-08
4	Signal Generator	83732B	VS3449051	HP	2011-05-08
5	Bilog Antenna	CBL6111C	2768	Schaffner	2011-12-14
6	Dipole antenna	UHAP	1101	Schwarzbeck	2012-06-16
7	Horn Antenna	3115	9607-4877	EMCO	2011-05-15
8	Horn Antenna	3116	00060089	EMCO	2011-05-15

## 2 General Product Information

### 2.1 Product Function and Intended Use

The EUT (equipment under test) is a room thermostat. For the further information, refer to the user's manual.

### 2.2 Ratings and System Details

Type	: Room Thermostat
Rated Voltage	: DC 4.2V by Li-battery
Maximum Current	: <1A
Type of antenna	dedicated
Protection Class	: III
Class	: B
FCC ID	: XLXA3900

Channel information

Channel No.	Centre Frequency	Allowable Frequency Error
1	433.594MHz	±30kHz
2	433.794MHz	±30kHz
3	433.994MHz	±30kHz
4	434.194MHz	±30kHz
5	434.394MHz	±30kHz
6	434.594MHz	±30kHz

The product is a transceiver that transmit data by 6 channels, so the test item of radiated emission were performed on two frequency points that the lowest 433.594MHz and the highest 434.594MHz.

### 2.3 Independent Operation Modes

The basic operation modes are: "On", "Off".

### 2.4 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

### 2.5 Submitted Documents

Circuit diagram, PCB layout, BOM, User's manual, Nameplate.

## **3 Test Set-up and Operation Modes**

### **3.1 Test Specification**

FCC Part 15 Subpart C  
Section 15.203  
Section 15.205  
Section 15.207  
Section 15.209  
Section 15.231

### **3.2 Principle of Configuration Selection**

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.

### **3.3 Physical Configuration for Testing**

Refer to the related paragraph of this report.

### **3.4 Test Operation and Test Software**

Refer to the related paragraph of this report. No software was used.

### **3.5 Special Accessories and Auxiliary Equipment**

None.

### **3.6 Countermeasures to achieve EMC Compliance**

None.

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## 4 Summary of Test Results

Description of Test	Result
Section 15.203 Antenna Requirement	Compliant
Section 15.205 Restricted Band	Compliant
Section 15.209 General Requirement	Compliant
Section 15.231 (c) 20dB Bandwidth Testing	Compliant
Section 15.231 (a) Radiated Emission	Compliant
Section 15.231 (b) Radiated Emission	Compliant

## 4.1 Test Result

### 4.1.1 Section 15.203 Antenna Requirement

<b>Result:</b>	<b>Passed</b>
----------------	---------------

According to 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

This product has a permanent antenna, fulfil the requirement of this section.



### 4.1.2 Section 15.231 (c) 20dB Bandwidth Testing

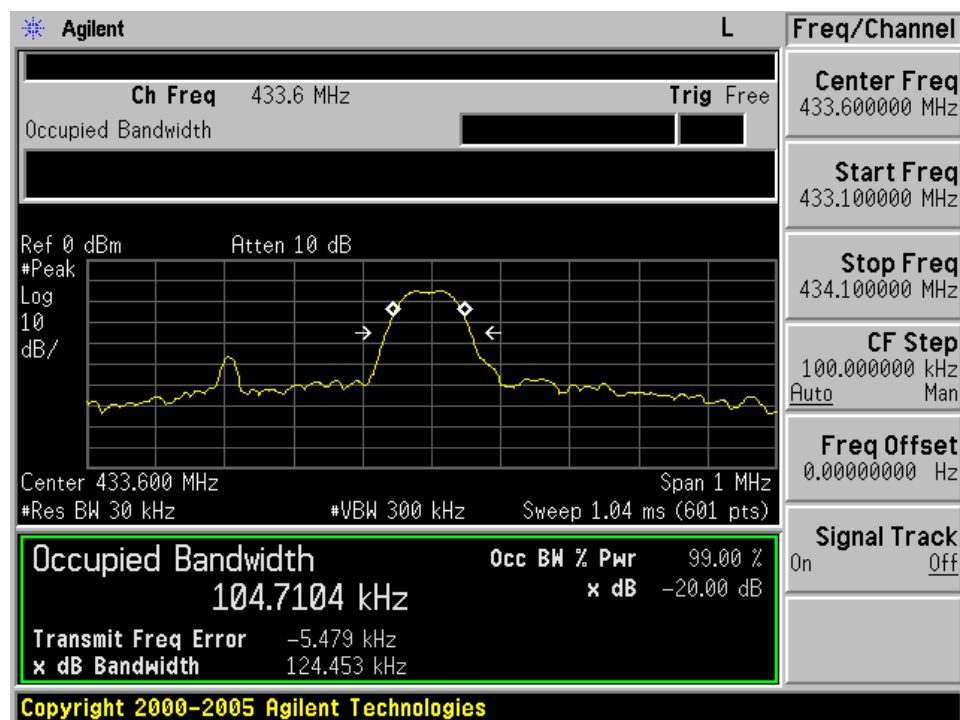
**Result:**
**Passed**

Date of testing : 2010-11-30  
 Test procedure : FCC Part 15 Subpart C:2009  
 Frequency range : 30 – 1000MHz  
 Limits : The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the point 20dB down from the modulated carrier.  
 Kind of test site : Semi-anechoic chamber  
 Operation mode : On

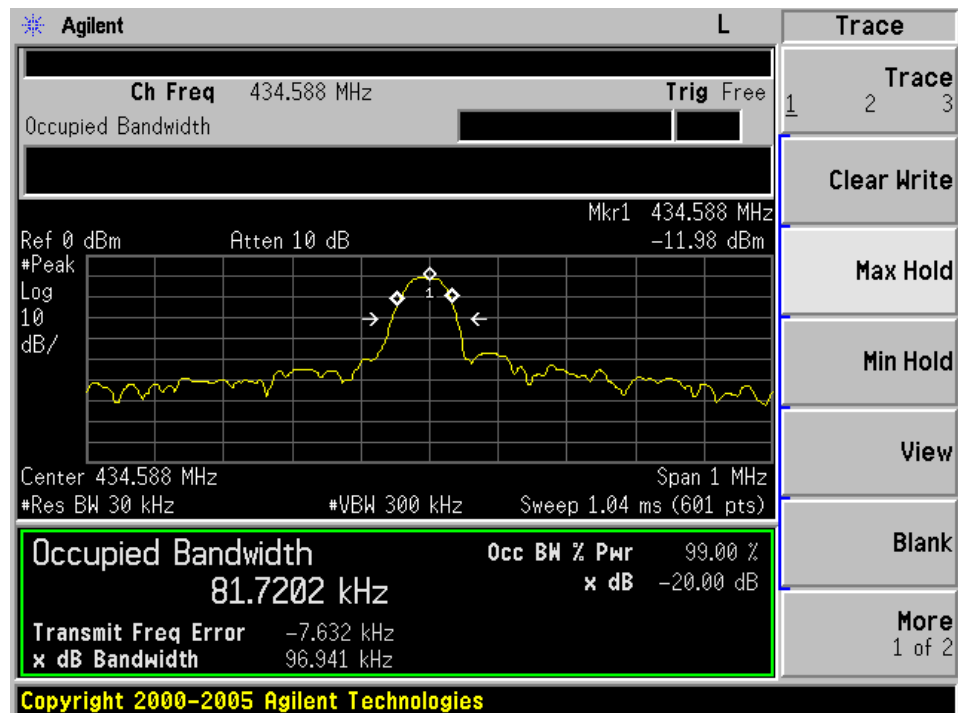
#### Calculation of bandwidth limit

The lowest frequency  
 $433.594\text{MHz} * 0.0025 = 1083.985\text{kHz}$   
 The bandwidth of EUT is 124.453 kHz

**Figure 1: 20dB Bandwidth of the lowest frequency**



The highest frequency  
 $434.594\text{MHz} \cdot 0.0025 = 1086.485\text{kHz}$   
The bandwidth of EUT is 96.941 kHz

**Figure 2: 20dB Bandwidth of the highest frequency**


#### **4.1.3 Section 15.205, Section 15.209, Section 15.231 (b) Radiated Emission**

**Result:**

**Passed**

Date of testing : 2010-11-30  
Test procedure : FCC Part 15 Subpart C:2009  
Frequency range : 30MHz – 10<sup>th</sup> harmonic emission  
Limits : According to section 15.209 and section 15.231 (b)  
Kind of test site : Semi-anechoic chamber  
Operation mode : On

#### **Measuring configuration and description**

The measurement setup was made according to FCC Part 15 Subpart C: 2009.

The test equipment listed in 1.1, table 1 of this report are as specified in CISPR 16-1 and ANSI C63.4-2003.

The EUT was placed on a turntable. The turntable can turn in 360°. A Bi-Log antenna is fixed 10m from centre of the turntable and a horn antenna is fixed 3m from centre of the turntable.

According to section 15.35, unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.255, and 15.509-15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

During the test, the turntable was rotated fully with a measurement antenna oriented for both horizontal and vertical polarisation. The antenna was adjusted between 1m and 4m in height above the ground plane to find the max disturbance.

### Calculation of field strength limit:

According to section 15.231, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

For the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F) - 7083.3333$

Where F is the frequency in MHz,

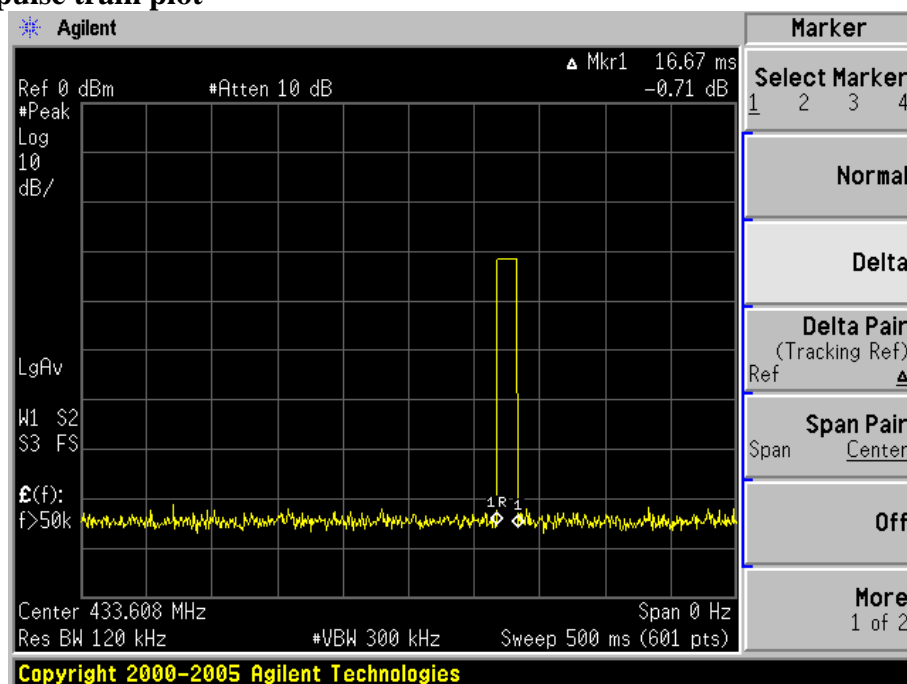
The maximum permitted field strength of any unwanted emission must be 20 dB below the maximum allowable fundamental field strength or to the general limits of section 15.209, whichever limit permits higher field strength.

The frequency range from 30 MHz to the tenth harmonic of the highest fundamental frequency was investigated to measure any radiated emission.

### Pulsed emission averaging factor:

The EUT is a pulsed emission device. Therefore, the method of section 15.35 for averaging a pulsed emission may be used. The plot of the pulse train and average factor calculations are shown below:

**Figure 3: 200ms pulse train plot**

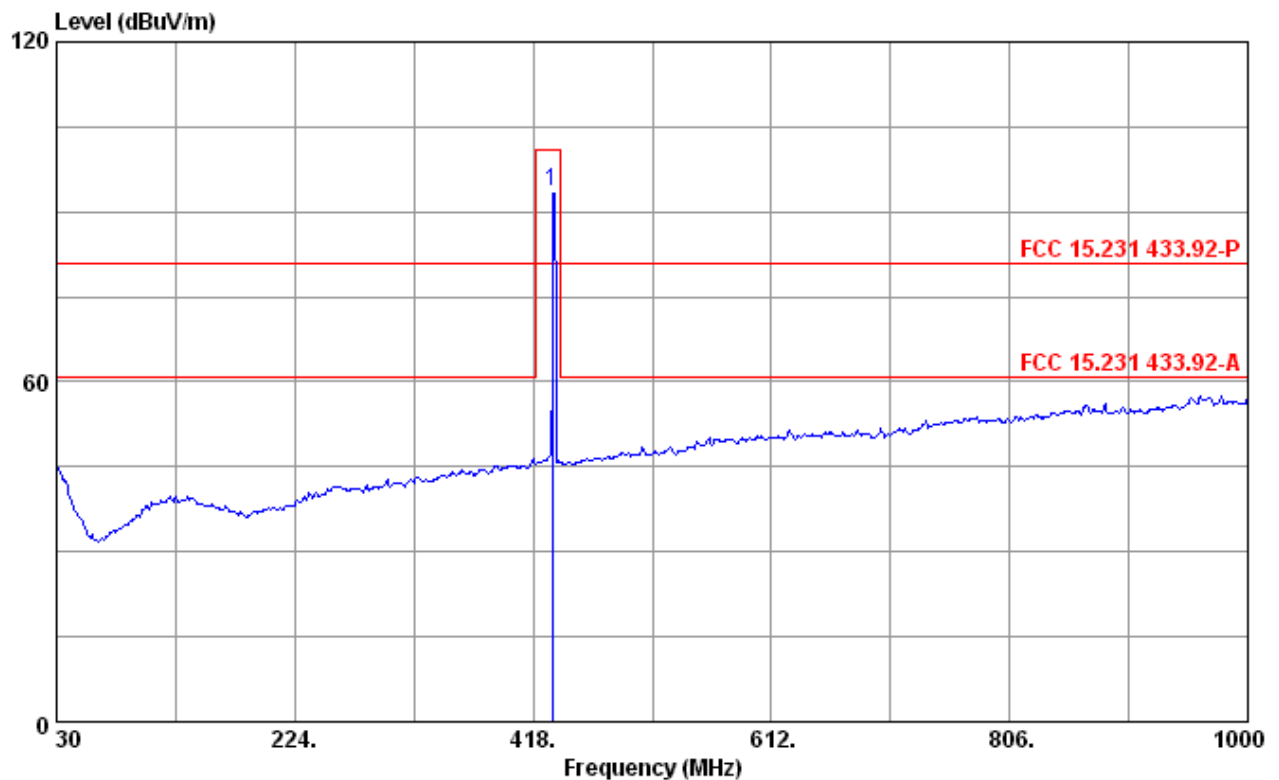


### Average factor calculation:

$$\text{Average factor} = 20 \text{ Log } (16.67\text{ms} / 100\text{ms}) = -15.56 \text{ dB}$$

The following diagram and table show the measurement value:

**Figure 4: Spectral diagrams and measurement results, Horizontal polarization, 30MHz-1GHz, 3m, the lowest frequency.**



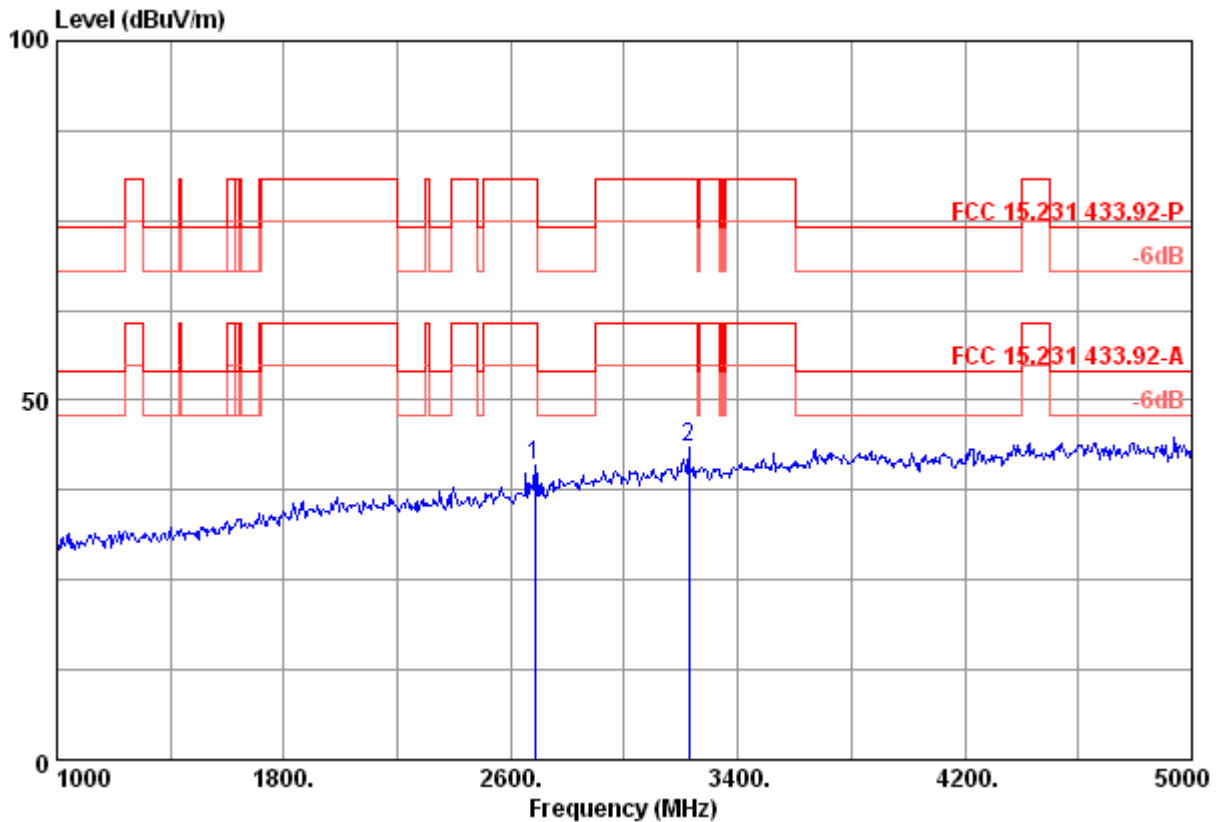
Final measurement result:

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Average Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Remark
433.57	17.39	3.13	/	93.64	100.81	7.17	PK
433.57	/	/	-15.56	78.08	80.81	2.73	AV

Note: PK reading level = PK result, because it has already included the antenna factor and cable loss.

AV result = PK result + Average factor

**Figure 5: Spectral diagrams and measurement results, Horizontal polarization, >1GHz, 3m, the lowest frequency.**



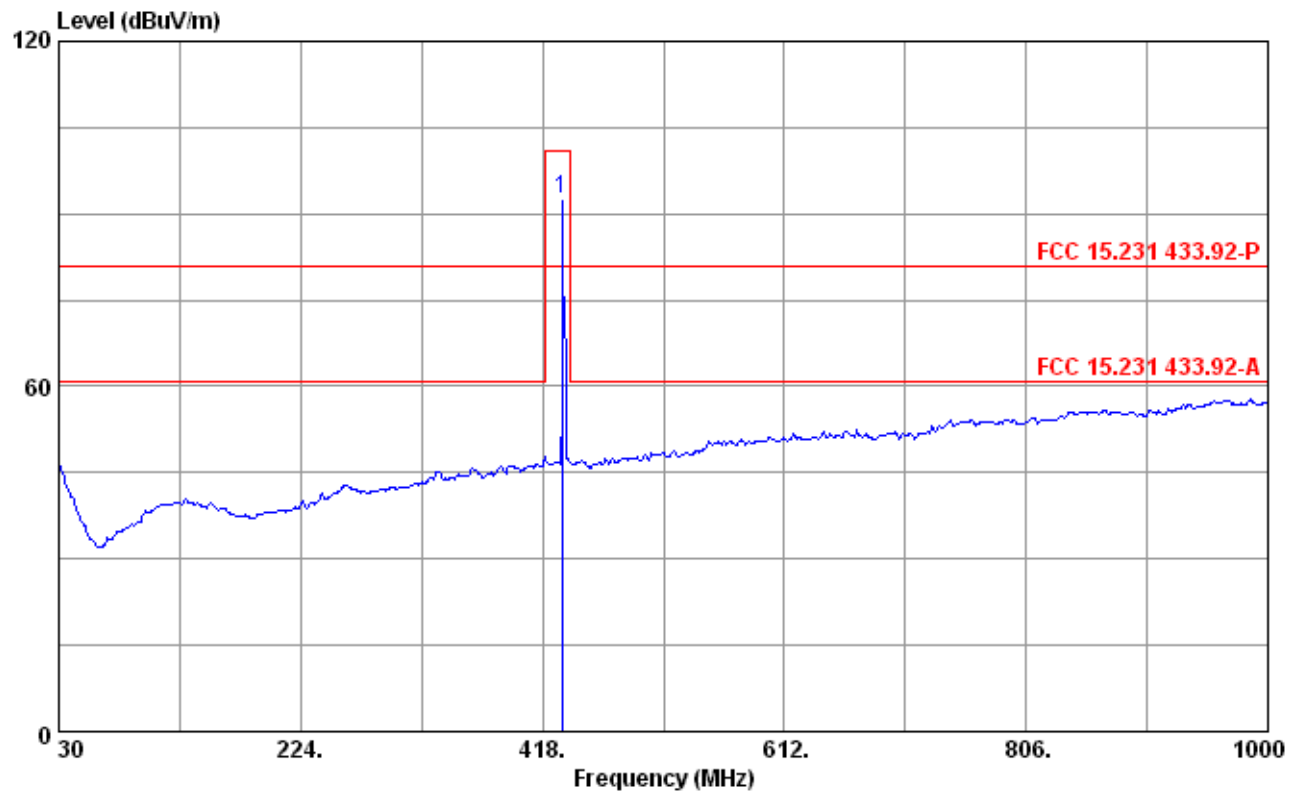
Final measurement result:

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Average Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Remark
2684.00	30.42	7.96	/	40.98	80.81	39.83	PK
2684.00	/	/	-15.56	25.42	60.81	35.39	AV
3228.00	32.58	8.81	/	43.04	80.81	37.77	PK
3228.00	/	/	-15.56	27.48	60.81	33.33	AV

Note: PK reading level = PK result, because it has already included the antenna factor and cable loss.

AV result = PK result + Average factor

**Figure 6: Spectral diagrams and measurement results, Vertical polarization, 30MHz-1GHz, 3m, the lowest frequency.**



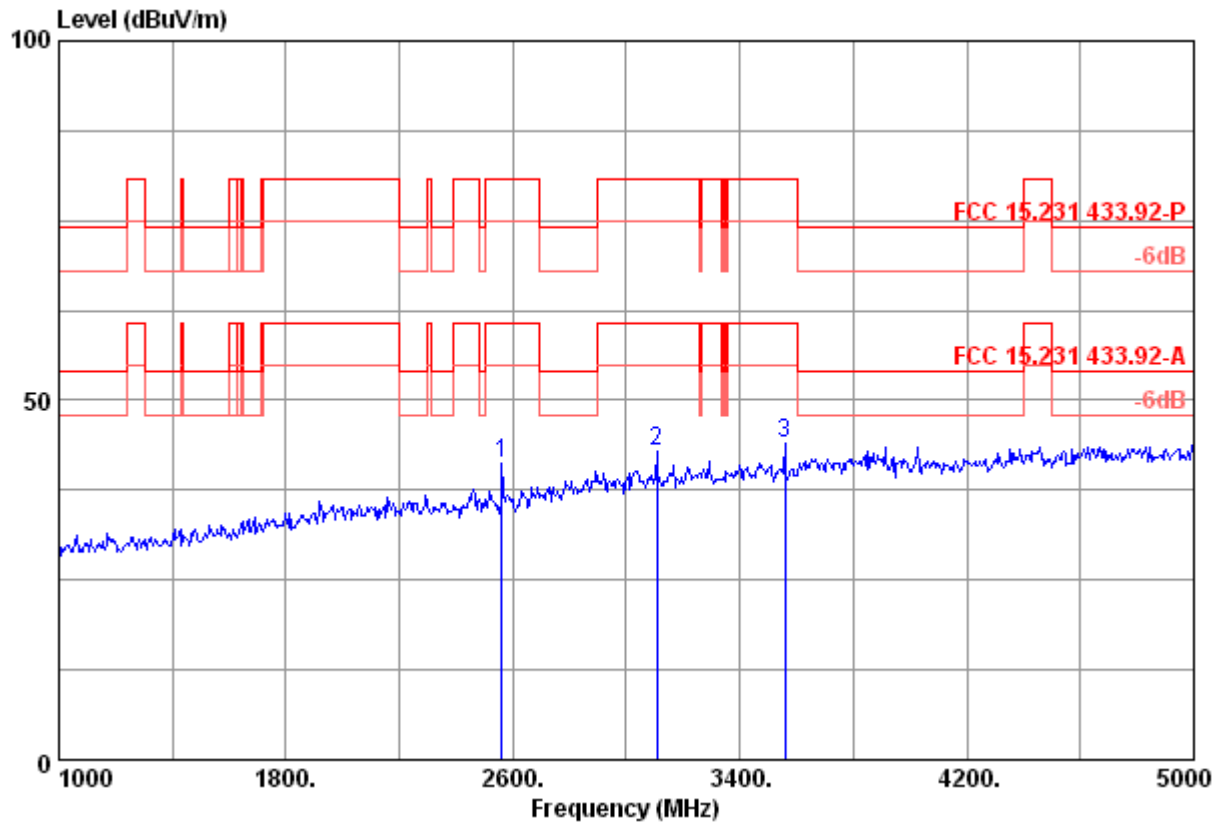
Final measurement result:

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Average Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Remark
433.57	17.39	3.13	/	92.71	100.81	8.10	PK
433.57	/	/	-15.56	77.15	80.81	3.66	AV

Note: PK reading level = PK result, because it has already included the antenna factor and cable loss.

AV result = PK result + Average factor

**Figure 7: Spectral diagrams and measurement results, Vertical polarization, >1GHz, 3m, the lowest frequency.**



Final measurement result:

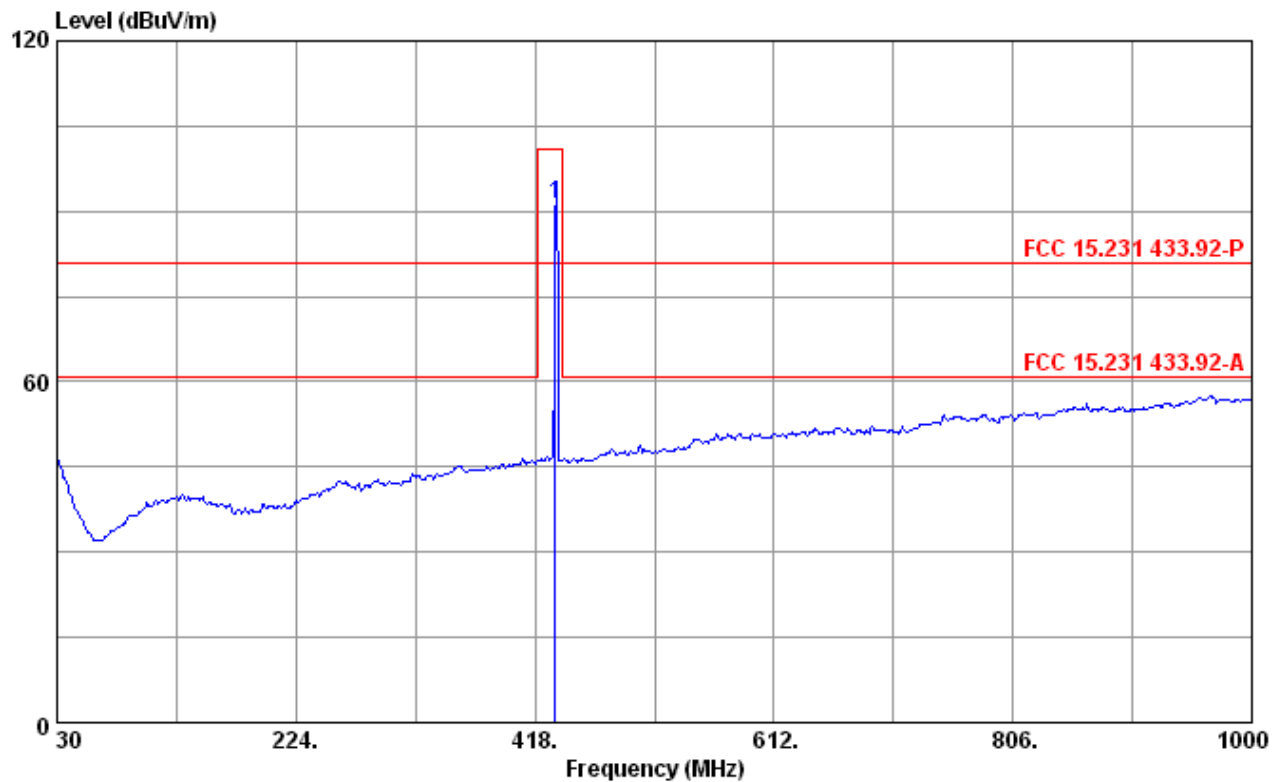
Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Average Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Remark
2560.00	29.83	7.73	/	40.26	80.81	40.55	PK
2560.00	/	/	-15.56	23.70	60.81	36.11	AV
3108.00	32.27	8.67	/	38.35	80.81	42.46	PK
3108.00	/	/	-15.56	22.79	60.81	38.02	AV
3560.00	34.40	9.20	/	37.48	80.81	43.33	PK
3560.00	/	/	-15.56	21.92	60.81	38.89	AV

Note: PK reading level = PK result, because it has already included the antenna factor and cable loss.

AV result = PK result + Average factor



**Figure 8: Spectral diagrams and measurement results, Horizontal polarization, 30MHz-1GHz, 3m, the highest frequency.**



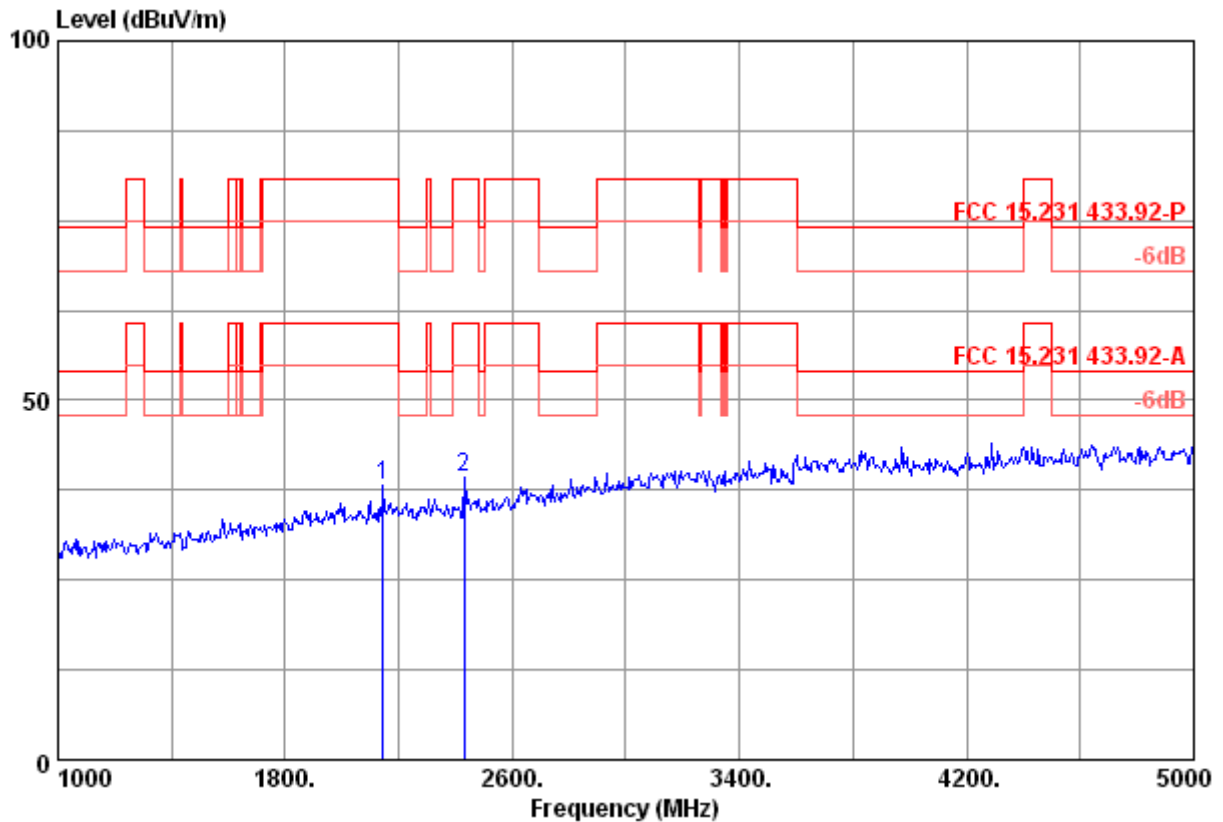
Final measurement result:

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Average Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Remark
434.55	17.36	3.13	/	91.41	100.84	9.43	PK
434.55	/	/	-15.56	75.56	80.84	5.28	AV

Note: PK reading level = PK result, because it has already included the antenna factor and cable loss.

AV result = PK result + Average factor

**Figure 9: Spectral diagrams and measurement results, Horizontal polarization, >1GHz, 3m, the highest frequency.**



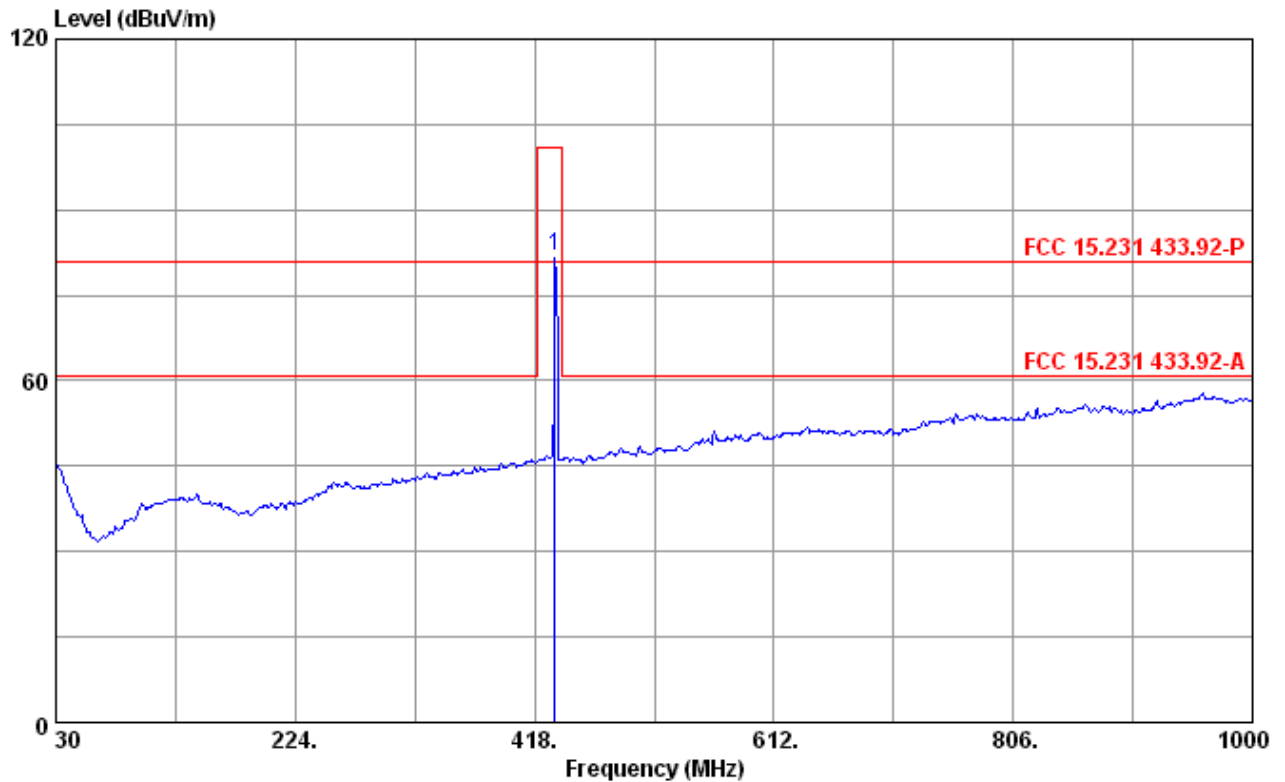
Final measurement result:

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Average Factor (dB)	Result (dBUV/m)	Limit (dBUV/m)	Margin (dBUV/m)	Remark
2144.00	29.28	6.93	/	38.14	80.84	42.70	PK
2144.00	/	/	-15.56	22.58	60.84	38.26	AV
2432.00	29.46	7.46	/	39.20	80.84	41.64	PK
2432.00	/	/	-15.56	23.64	60.84	37.20	AV

Note: PK reading level = PK result, because it has already included the antenna factor and cable loss.

AV result = PK result + Average factor

**Figure 10: Spectral diagrams and measurement results, Vertical polarization, 30MHz-1GHz, 3m, the highest frequency.**



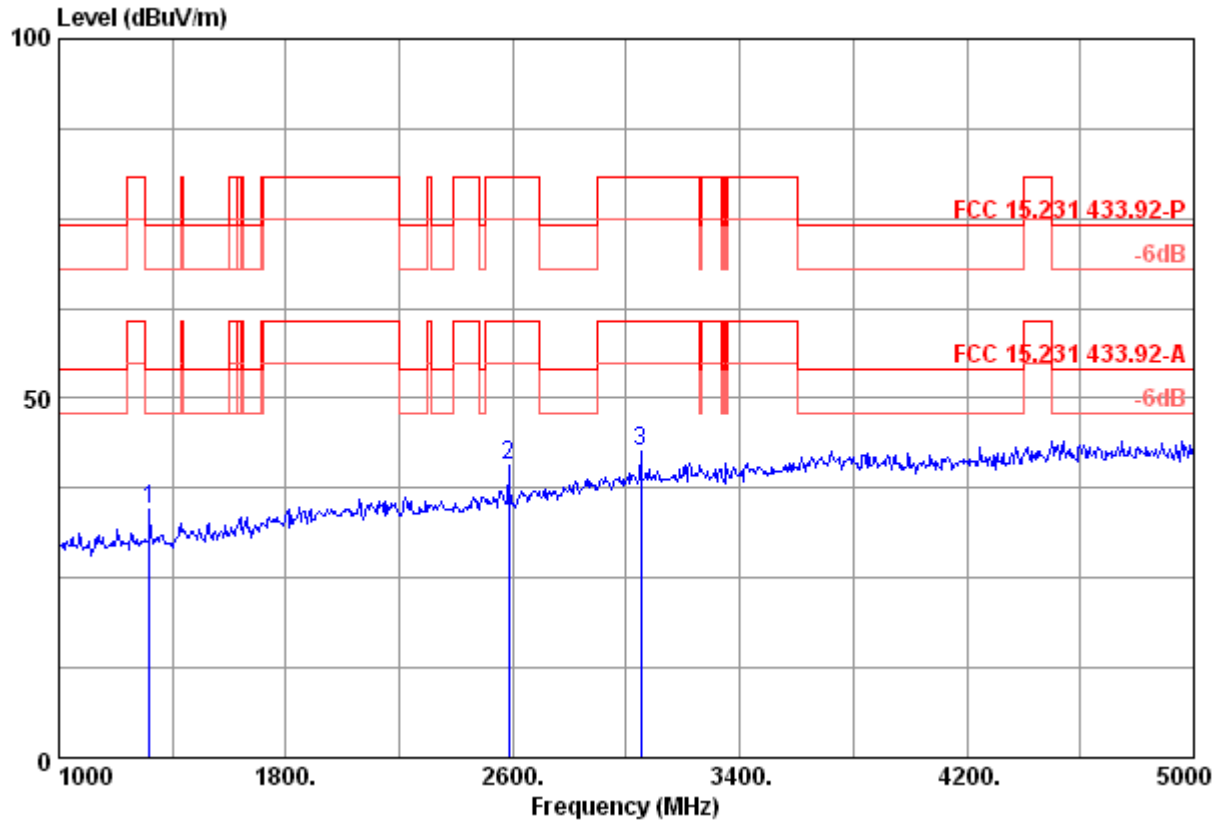
Final measurement result:

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Average Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Remark
434.55	6.00	2.52	/	82.66	100.84	18.15	PK
434.55	/	/	-15.56	69.08	80.84	11.73	AV

Note: PK reading level = PK result, because it has already included the antenna factor and cable loss.

AV result = PK result + Average factor

**Figure 11: Spectral diagrams and measurement results, Vertical polarization, >1GHz, 3m, the highest frequency.**



Final measurement result:

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Average Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dBuV/m)	Remark
1320.00	26.06	5.38	/	34.64	74.00	39.36	PK
1320.00	/	/	-15.56	19.08	54.00	41.92	AV
2584.00	29.92	7.77	/	40.62	80.84	40.22	PK
2584.00	/	/	-15.56	25.06	60.84	35.78	AV
3052.00	32.13	8.61	/	42.58	80.84	38.26	PK
3052.00	/	/	-15.56	27.02	60.84	33.82	AV

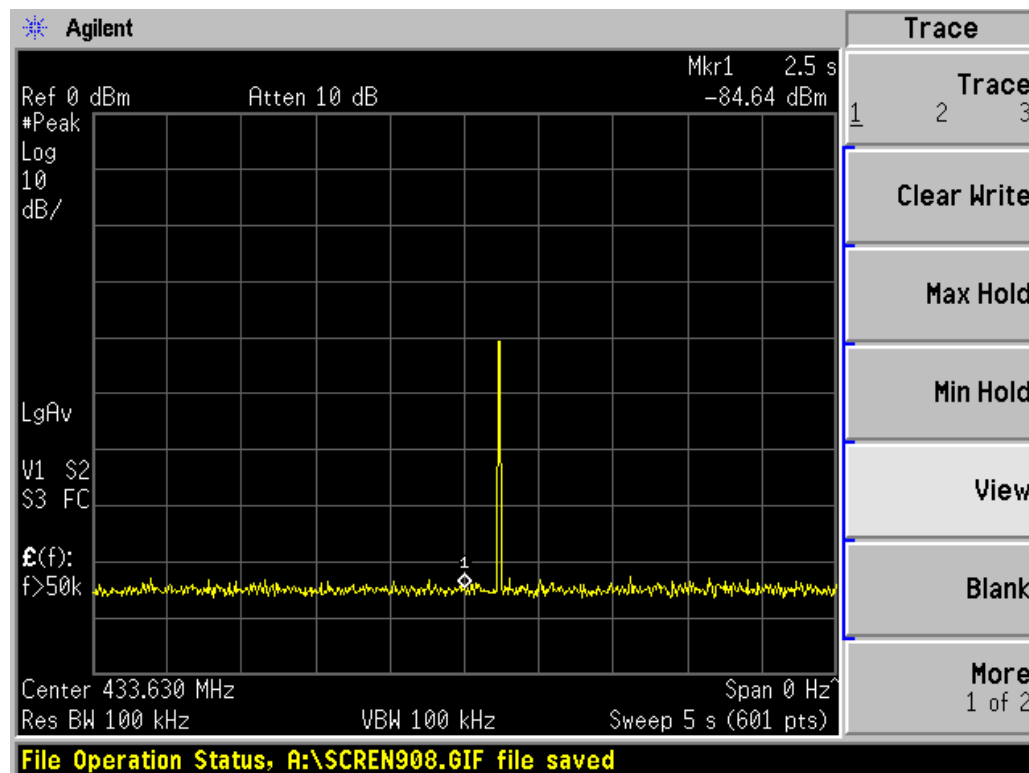
Note: PK reading level = PK result, because it has already included the antenna factor and cable loss.

AV result = PK result + Average factor

#### 4.1.4 Section 15.231 (a) Limiting operations and duration of transmission

A transmitter activated automatically cease transmission within 5 seconds after activation.

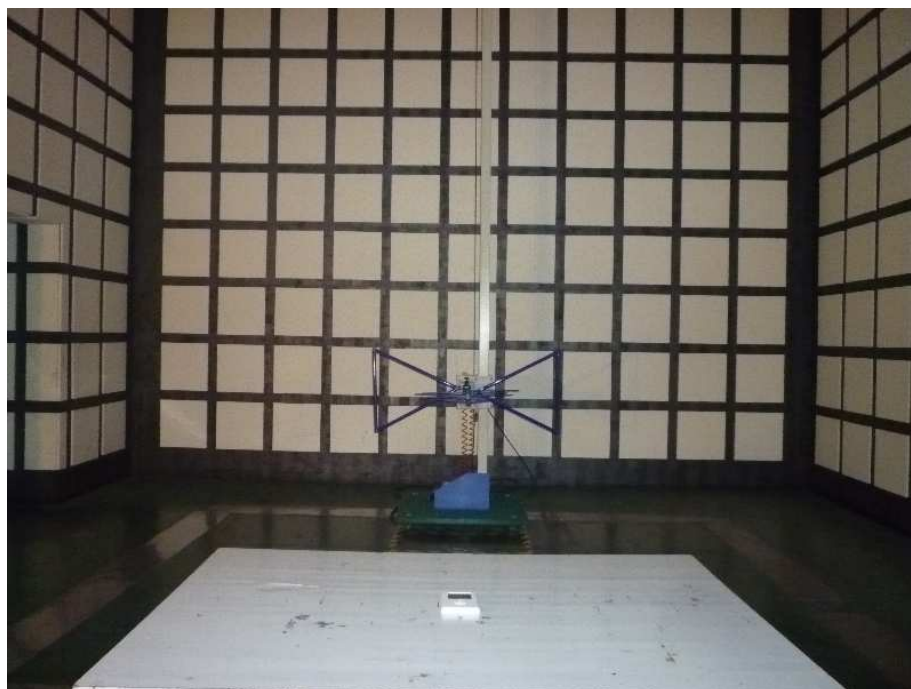
**Figure 12: Duration of transmission**



According to the figure 12, the EUT can automatically cease transmission within 5 seconds after activation, therefore the EUT meet the requirement of section 15.231(a).

## 5 Photographs of the Test Set-Up

**Photograph 1: Set-up for measurement of radiated emission, <1GHz**



**Photograph 2: Set-up for measurement of radiated emission, >1GHz**



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