

APPLICATION CERTIFICATION  
On Behalf of  
Shenzhen San Fu Da Electronics Co., Ltd.

Wireless Indoor/Outdoor Thermometer  
Model No.: 536, 31638

FCC ID: VVG53631638TX

Prepared for : Shenzhen San Fu Da Electronics Co., Ltd.  
Address : 6/F., Block B, Huali Industrial Building, District 28, Baoan  
Shenzhen, China

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Report Number : ATE20072882  
Date of Test : November 27, 2007  
Date of Report : November 29, 2007

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## Test Report Certification

Applicant : Shenzhen San Fu Da Electronics Co., Ltd.  
 Manufacturer : Shenzhen San Fu Da Electronics Co., Ltd.  
 EUT Description : Wireless Indoor/Outdoor Thermometer  
 (A) MODEL NO.: 536, 31638  
 (B) SERIAL NO.: N/A  
 (C) POWER SUPPLY: DC 3.0V (AAA Batteries ×2)

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.231: 2007 & ANSI 63.4: 2003

The device described above is tested by ACCURATE TECHNOLOGY CO. LTD to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.231 limits. The measurement results are contained in this test report and ACCURATE TECHNOLOGY CO. LTD is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of ACCURATE TECHNOLOGY CO. LTD.

Date of Test : November 27, 2007

Prepared by :   
 (Engineer)

Reviewer :   
 (Quality Manager)

Approved & Authorized Signer :   
 (Manager)

# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

EUT : Wireless Indoor/Outdoor Thermometer

Model Number : 536, 31638  
(Note: Model 31638 is identical to model 536, except appearance color are difference. Therefore only model 536 is tested.)

Operation Frequency : 433.9MHz  $\pm$  100kHz

Power Supply : DC 3.0V(AAA Battery  $\times$  2)

Applicant : Shenzhen San Fu Da Electronics Co., Ltd.  
Address : 6/F., Block B, Huali Industrial Building, District 28, Baoan Shenzhen, China

Manufacturer : Shenzhen San Fu Da Electronics Co., Ltd.  
Address : 6/F., Block B, Huali Industrial Building, District 28, Baoan Shenzhen, China

Date of sample received : November 21, 2007  
Date of Test : November 27, 2007

## 1.2. Description of Test Facility

EMC Lab : Listed by FCC  
The Registration Number is 274801

Listed by Industry Canada  
The Registration Number is IC4174

Accredited by China National Accreditation Committee for Laboratories  
The Certificate Registration Number is L0579

Name of Firm : Shenzhen Academy of Metrology & Quality Inspection  
Site Location : Bldg. Metrology & Quality Inspection, Longzhu Road, Nanshan, Shenzhen, Guangdong, P.R. China

## 1.3. Measurement Uncertainty

Conducted emission expanded uncertainty = 3.5dB, k=2

Radiated emission expanded uncertainty = 4.5dB, k=2

## 2. MEASURING DEVICE AND TEST EQUIPMENT

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

Kind of equipment	Manufacturer	Type	S/N	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	03.31.2008
EMI Test Receiver	Rohde&Schwarz	ESI26	838786/013	01.24.2008
Bilog Antenna	Schwarzbeck	VULB9163	9163-194	03.31.2008
Bilog Antenna	Chase	CBL6112B	2591	01.24.2008
Horn Antenna	Rohde&Schwarz	HF906	100013	01.24.2008
Spectrum Analyzer	Anritsu	MS2651B	6200238856	03.31.2008
Pre-Amplifier	Agilent	8447D	2944A10619	03.31.2008

### 3. THE FIELD STRENGTH OF RADIATION EMISSION

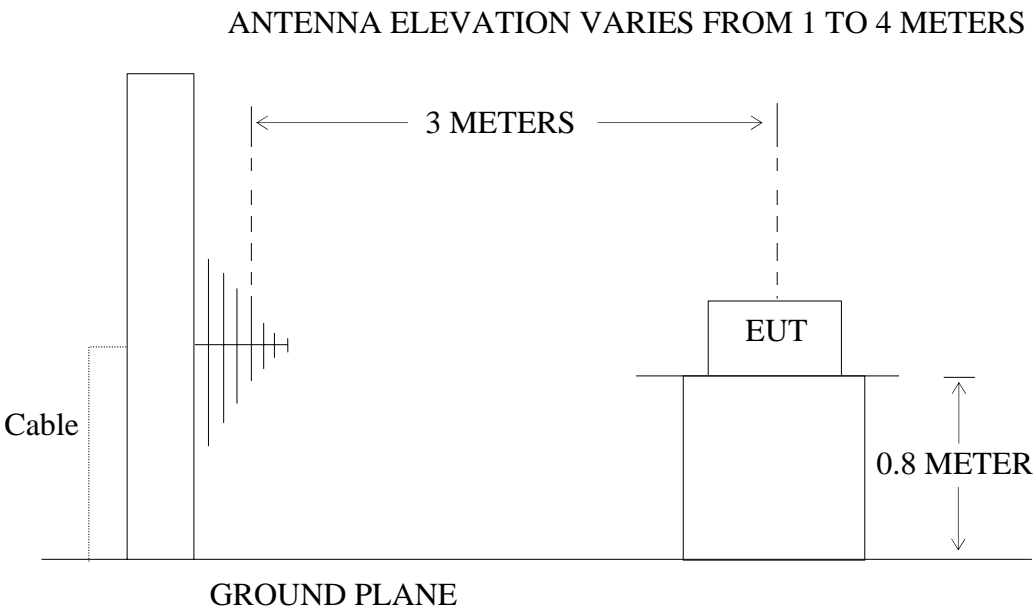
#### 3.1. Block Diagram of Test Setup

##### 3.1.1. Block diagram of connection between the EUT and simulators



(EUT: Wireless Indoor/Outdoor Thermometer)

##### 3.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Wireless Indoor/Outdoor Thermometer)

#### 3.2. The Field Strength of Radiation Emission Measurement Limits

##### 3.2.1 Radiation Emission Measurement Limits According to Section 15.231(e)

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [ $\mu\text{V/m}$ ]	Field Strength of Spurious Emission [Average] [ $\mu\text{V/m}$ ]
40.66-40.70	1000	100
70-130	500	50
130-174	500 - 1500	50-150
174-260	1500	150
260-470	1500-5000	150-500
Above 470	5000	500

Where F is the frequency in MHz, The formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174MHz,  $\mu\text{V/m}$  at 3 meters= $22.72727(F)-2454.545$ ; For the band 260-470MHz,  $\mu\text{V/m}$  at 3 meters= $16.6667(F)-2833.3333$ . The maximum permissible unwanted emission level is 20dB below the maximum permitted fundamental level.

### 3.2.2 Restricted Band Radiation Emission Measurement Limits According to FCC part 15 Section 15.205 and Section 15.209.

## 3.3. Configuration of EUT on Measurement

The following equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

### 3.3.1. Wireless Indoor/Outdoor Thermometer (EUT)

Model Number	:	536
Serial Number	:	N/A
Manufacturer	:	Shenzhen San Fu Da Electronics Co., Ltd.

## 3.4. Operating Condition of EUT

3.4.1. Setup the EUT and simulator as shown as Section 3.1.

3.4.2. Turn on the power of all equipment.

3.4.3. Let the EUT work in measuring modes (TX) measure it.

## 3.5. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI 63.4 on radiated emission measurement.

The bandwidth of test receiver (R&S ESI26) is set at 120KHz in 30-1000MHz, and 1MHz in 1000-5000MHz.

The frequency range from 30MHz to 5000MHz is checked.

### 3.6.The Field Strength of Radiation Emission Measurement Results

**PASS.**

The frequency range 30MHz to 5000MHz is investigated.

Date of Test:	<u>November 27, 2007</u>	Temperature:	<u>25°C</u>
	<u>Wireless Indoor/Outdoor</u>		
EUT:	<u>Thermometer</u>	Humidity:	<u>50%</u>
Model No.:	<u>536</u>	Power Supply:	<u>DC 3.0V(AAA Battery ×2)</u>
Test Mode:	<u>TX</u>	Test Engineer:	<u>Andy</u>

#### Fundamental Emission

Frequency (MHz)	Reading (dBμV/m)	Factor Corr.	Average Factor	Result(dBμV/m)		Limit(dBμV/m)		Margin(dBμV/m)		Polarization
	PEAK	(dB)	(dB)	AV	PEAK	AV	PEAK	AV	PEAK	
433.851	98.4	-16.1	-15.6	66.7	82.3	72.8	92.8	6.1	10.5	Horizontal
433.851	91.1	-16.1	-15.6	59.4	75.0	72.8	92.8	13.4	17.8	Vertical

#### Spurious Emission

Frequency (MHz)	Reading (dBμV/m)	Factor Corr.	Average Factor	Result(dBμV/m)		Limit(dBμV/m)		Margin(dBμV/m)		Polarization
	PEAK	(dB)	(dB)	AV	PEAK	AV	PEAK	AV	PEAK	
867.698	71.3	-12.1	-15.6	43.6	59.2	52.8	72.8	9.2	13.6	Horizontal
*1301.542	60.3	-7.2	-15.6	37.5	53.1	54.0	74.0	16.5	20.9	
1735.381	52.2	-5.7	-15.6	30.9	46.5	52.8	72.8	21.9	26.3	
2169.225	50.8	-4.5	-15.6	30.7	46.3	52.8	72.8	22.1	26.5	
2603.066	49.6	-3.0	-15.6	31.0	46.6	52.8	72.8	21.8	26.2	
3036.907	44.3	-1.8	-15.6	26.9	42.5	52.8	72.8	25.9	30.3	
3470.749	42.5	-0.4	-15.6	26.5	42.1	52.8	72.8	26.3	30.7	
*4338.435	35.5	1.5	-15.6	21.4	37.0	54.0	74.0	32.6	37.0	
867.698	64.6	-12.1	-15.6	36.9	52.5	52.8	72.8	15.9	20.3	Vertical
*1301.542	56.6	-7.2	-15.6	33.8	49.4	54.0	74.0	20.2	24.6	
1735.381	50.7	-5.7	-15.6	29.4	45.0	52.8	72.8	23.4	27.8	
2169.225	47.5	-4.5	-15.6	27.4	43.0	52.8	72.8	25.4	29.8	
2603.066	45.3	-3.0	-15.6	26.7	42.3	52.8	72.8	26.1	30.5	
3036.907	43.1	-1.8	-15.6	25.7	41.3	52.8	72.8	27.1	31.5	
3470.749	41.2	-0.4	-15.6	25.2	40.8	52.8	72.8	27.6	32.0	
3904.586	34.9	0.7	-15.6	20.0	35.6	54.0	74.0	34.0	38.4	



Note:

1. \*: Denotes restricted band of operation.

Measurements were made using a peak detector and average detector. Any emission Above 1000MHz and falling within the restricted bands of FCC Part 15 Section 15.205 were compliance with the emission limit of FCC Part 15 Section 15.209.

2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss – Amplifier Gain

3. FCC Limit for Average Measurement =  $16.6667(433.851) - 2833.3333 = 4397.5311 \mu\text{V/m} = 72.8 \text{dB}\mu\text{V/m}$

4. The spectral diagrams in appendix 1 display the measurement of peak values with corrected factors counted.

## 4. 20DB OCCUPIED BANDWIDTH

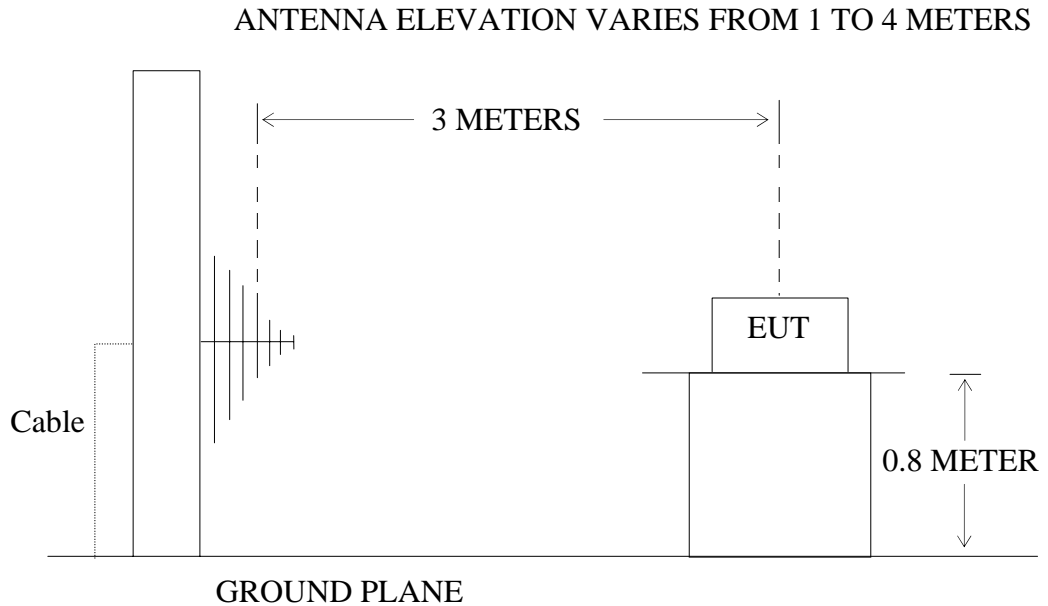
### 4.1. Block Diagram of Test Setup

#### 4.1.1. Block diagram of connection between the EUT and simulators



(EUT: Wireless Indoor/Outdoor Thermometer)

#### 4.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Wireless Indoor/Outdoor Thermometer)

### 4.2. The Bandwidth of Emission Limit According To FCC Part 15 Section

#### 15.231(c)

The bandwidth of emission shall be no wider than 0.25% of the center frequency. Therefore, the bandwidth of the emission limit is  $433\text{MHz} \times 0.25\% = 1082.5\text{KHz}$ . Bandwidth is determined at the two points 20 dB down from the top of modulated carrier.

### 4.3.EUT Configuration on Measurement

The following equipment are installed on the bandwidth of emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

#### 4.3.1. Wireless Indoor/Outdoor Thermometer (EUT)

Model Number : 536  
Serial Number : N/A  
Manufacturer : Shenzhen San Fu Da Electronics Co., Ltd.

### 4.4.Operating Condition of EUT

4.4.1.Setup the EUT and simulator as shown as Section 4.1.

4.4.2.Turn on the power of all equipment.

4.4.3.Let the EUT work in measuring mode (TX) measure it.

### 4.5.Test Procedure

4.5.1. Set SPA Center Frequency = Fundamental frequency, RBW = 3kHz, VBW = 10kHz, Span = 300kHz.

4.5.2. Set SPA Max hold. Mark peak, -20dB

#### 4.6. Measurement Result

**The EUT does meet the FCC requirement.**

-20dB bandwidth = 16.8 KHz < 1082.5 KHz.

The spectral diagrams in appendix I.

## 5. DURATION TIME AND SILENT PERIOD MEASUREMENT

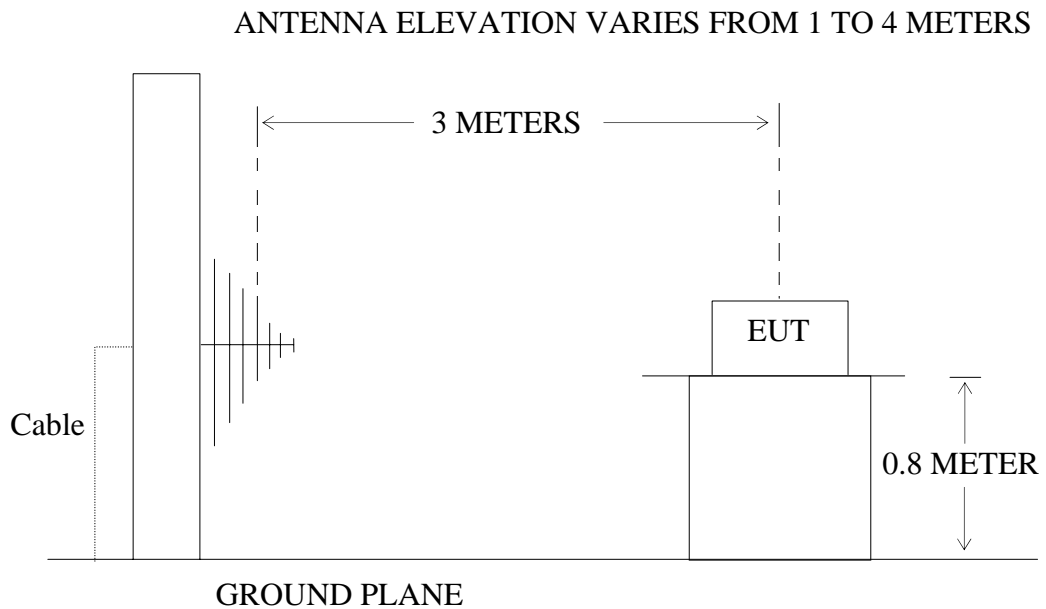
### 5.1. Block Diagram of Test Setup

#### 5.1.1. Block diagram of connection between the EUT and simulators



(EUT: Wireless Indoor/Outdoor Thermometer)

#### 5.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Wireless Indoor/Outdoor Thermometer)

### 5.2. Duration Time and silent period measurement according to FCC Part 15

#### Section 15.231(e)

Section 15.231(e) In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

### 5.3.EUT Configuration on Measurement

The following equipment are installed on duration time and silent period measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

#### 5.3.1. Wireless Indoor/Outdoor Thermometer (EUT)

Model Number : 536  
Serial Number : N/A  
Manufacturer : Shenzhen San Fu Da Electronics Co., Ltd.

### 5.4.Operating Condition of EUT

5.4.1.Setup the EUT and simulator as shown as Section 5.1.

5.4.2.Turn on the power of all equipment.

5.4.3.Let the EUT work in measuring mode (TX) measure it.

### 5.5.Test Procedure

5.5.1. Set SPA Center Frequency = Fundamental frequency, RBW = 10kHz,

VBW =30kHz, Span = 0Hz.

5.5.2. Set EUT as normal operation.

5.5.3. Set SPA View. Delta Mark time.

## 5.6. Measurement Result

**The EUT does meet the FCC requirement.**

Duration time = 0.920 second < 1 second

Silent period = 54.92 seconds > 30 times the duration of the transmission > 10seconds

The spectral diagrams in appendix I.

## 6. AVERAGE FACTOR MEASUREMENT

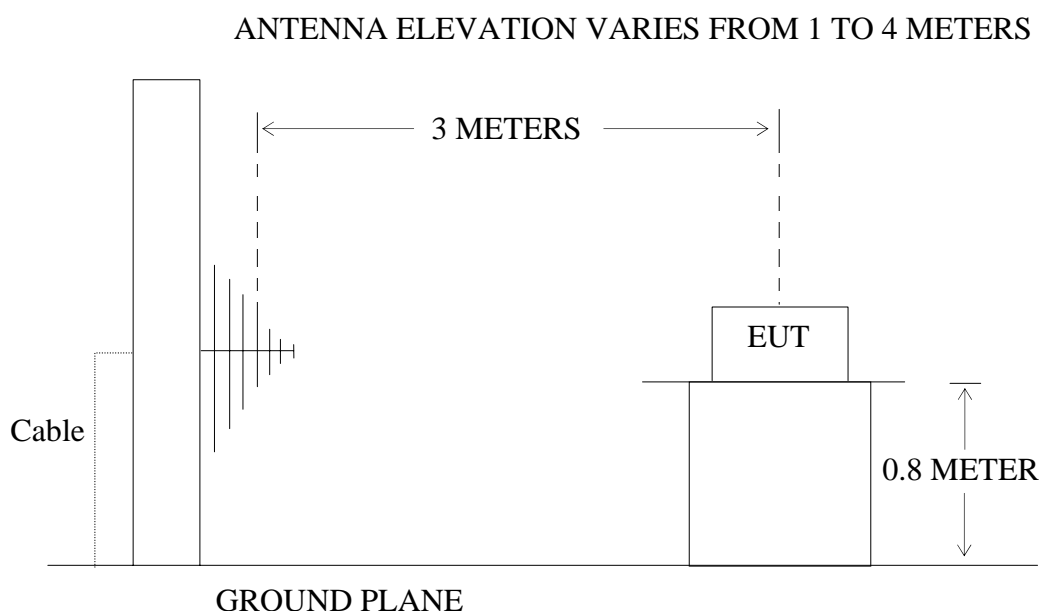
### 6.1. Block Diagram of Test Setup

#### 6.1.1. Block diagram of connection between the EUT and simulators



(EUT: Wireless Indoor/Outdoor Thermometer)

#### 6.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Wireless Indoor/Outdoor Thermometer)

### 6.2. Average factor Measurement according to ANSI 63.4: 2003

**ANSI 63.4: 2003 Section 13.1.4.2** Devices transmitting pulsed emissions and subject to a limit requiring an average detector function for radiated emissions shall initially be measured with an instrument that uses a peak detector. A radiated emission measured with a peak detector may then be corrected to a true average using the appropriate factor for emission duty cycle. This correction factor relates the measured peak level to the average limit and is derived by averaging absolute field strength over one complete pulse train that is 0.1 s, or less, in length. If the pulse train is longer than 0.1 s, the average shall be determined from the average absolute field strength during the 0.1 s interval in which the field strength is at a maximum. Instructions on calculating the duty cycle of a transmitter with pulsed emissions are provided in ANSI 63.4 H.4, step j.

**Average factor in dB =  $20 \log (\text{duty cycle})$**



### 6.3.EUT Configuration on Measurement

The following equipment are installed on average factor Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

#### 6.3.1. Wireless Indoor/Outdoor Thermometer (EUT)

Model Number : 536  
Serial Number : N/A  
Manufacturer : Shenzhen San Fu Da Electronics Co., Ltd.

### 6.4.Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3.Let the EUT work in measuring mode (TX) measure it.

### 6.5.Test Procedure

6.5.1. The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation.

6.5.2. Set SPA Center Frequency = Fundamental frequency, RBW = 10kHz,

VBW =30kHz, Span = 0Hz.

6.5.3. Set EUT as normal operation.

6.5.4. Set SPA View. Delta Mark time.

## 6.6. Measurement Result

**The duty cycle is simply the on time divided by the period:**

Effective period of one cycle = 100ms

Sum of pulse width =  $29 \times 0.57 \text{ ms} = 16.53 \text{ ms}$

Duty Cycle =  $16.53 \text{ ms} / 100 \text{ ms} = 0.1653$

**Therefore, the average factor is found by  $20 \log 0.1653 = -15.6 \text{ dB}$**

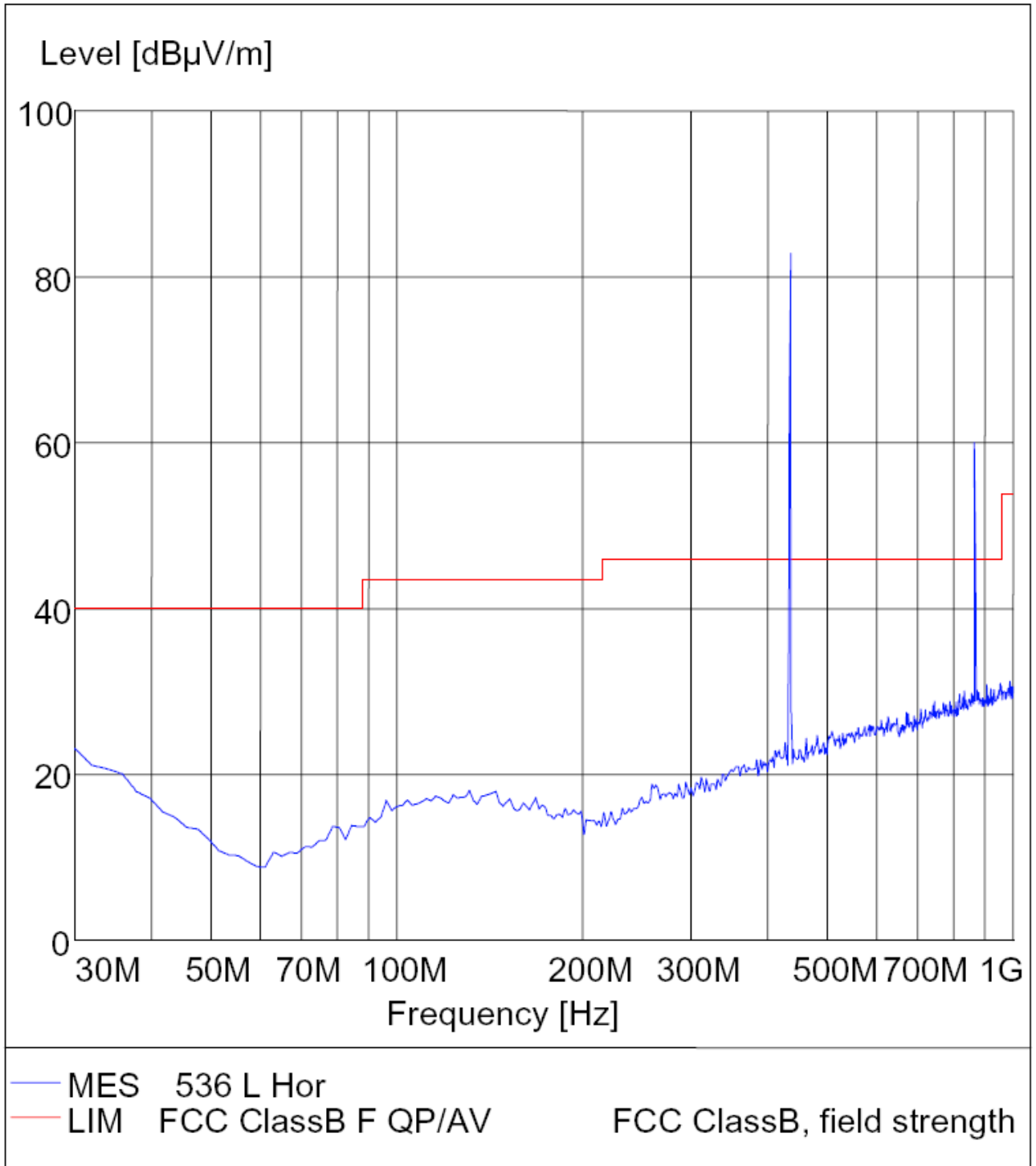
The spectral diagrams in appendix I.

# APPENDIX I (Test Curves)

Radiated Disturbance

FCC Part 15

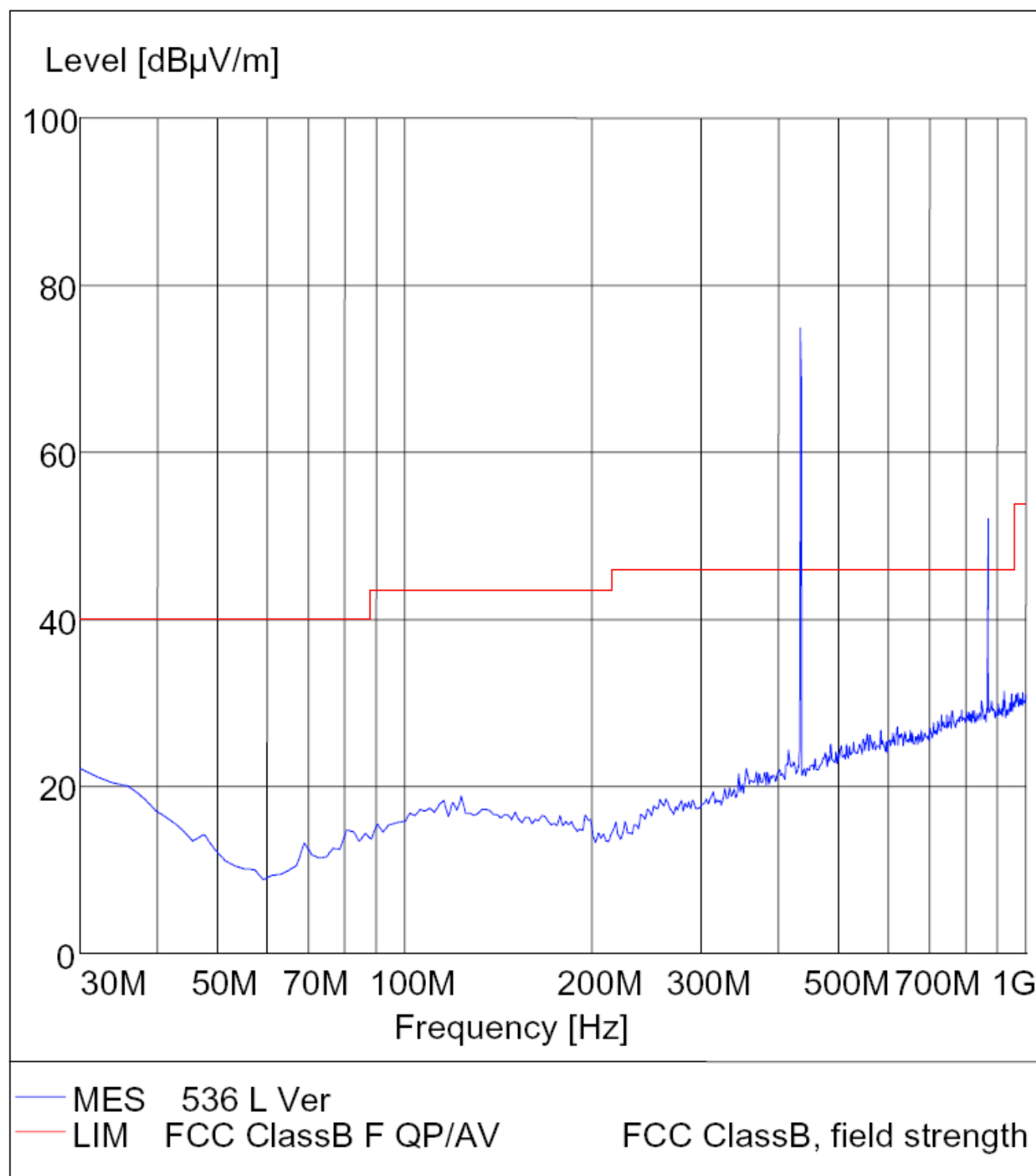
EUT: Wireless Indoor/Outdoor Thermometer M/N:536  
 Manufacturer: Shenzhen San Fu Da Electronics Co., Ltd.  
 Operating Condition: TX  
 Test Site: ATC EMC Lab.SAC  
 Operator: Feng  
 Test Specification: Horizontal  
 Comment : DC 3V



## Radiated Disturbance

## FCC Part 15

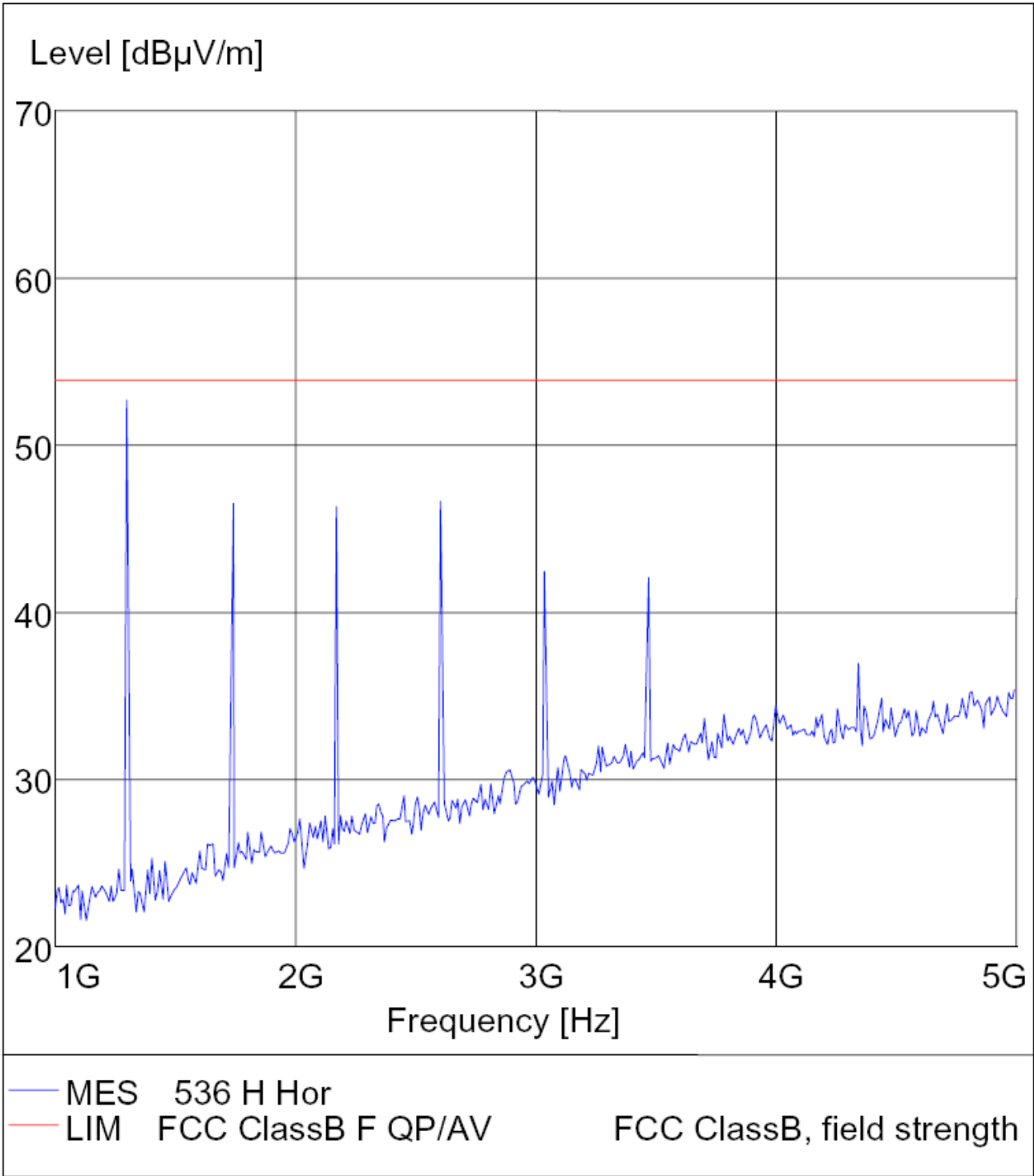
EUT: Wireless Indoor/Outdoor Thermometer M/N:536  
 Manufacturer: Shenzhen San Fu Da Electronics Co., Ltd.  
 Operating Condition: TX  
 Test Site: ATC EMC Lab.SAC  
 Operator: Feng  
 Test Specification: Vertical  
 Comment : DC 3V



Radiated Disturbance

FCC Part 15

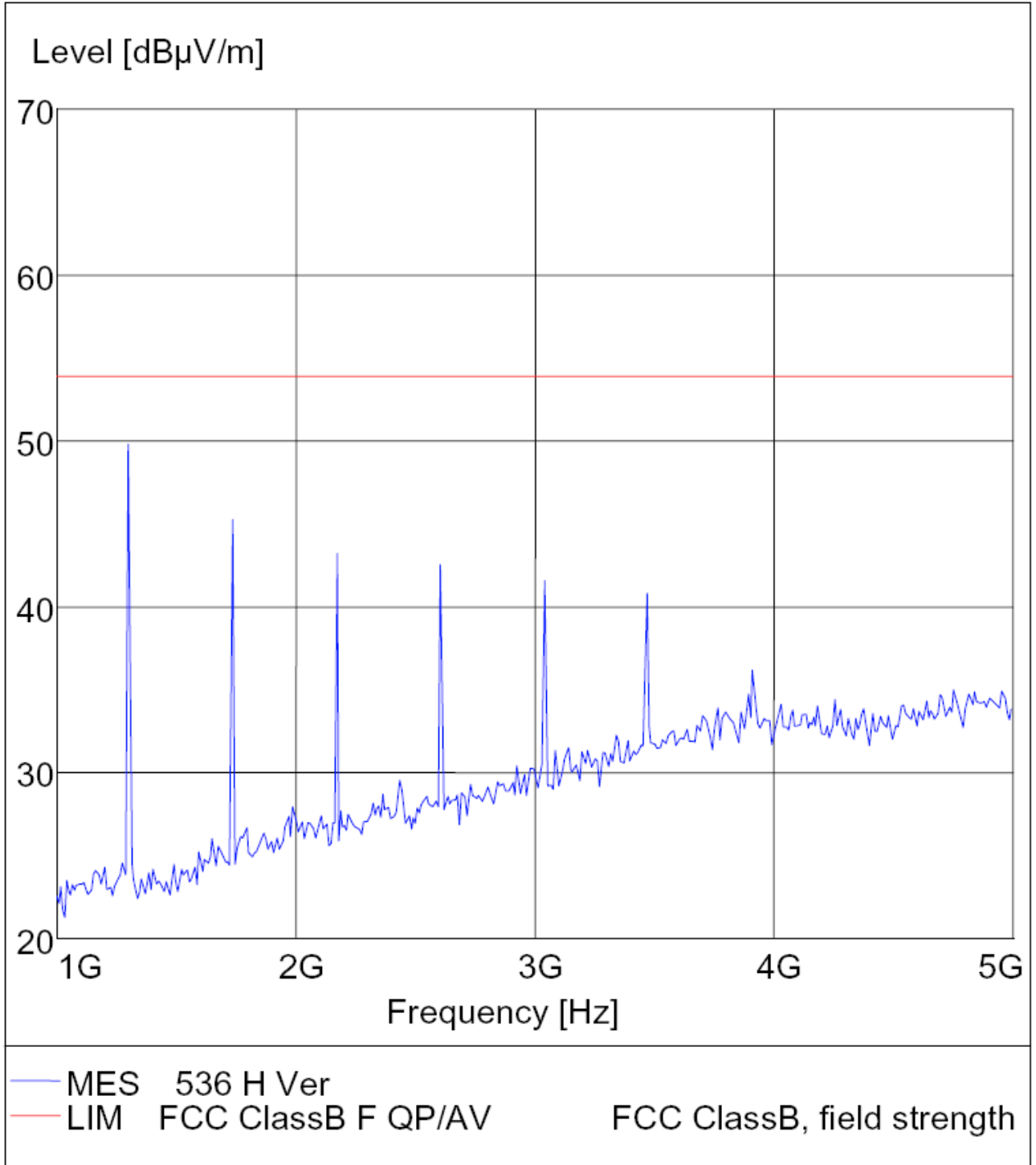
EUT: Wireless Indoor/Outdoor Thermometer M/N:536  
Manufacturer: Shenzhen San Fu Da Electronics Co., Ltd.  
Operating Condition: TX  
Test Site: ATC EMC Lab.SAC  
Operator: Feng  
Test Specification: Horizontal  
Comment: DC 3V



**Radiated Disturbance**

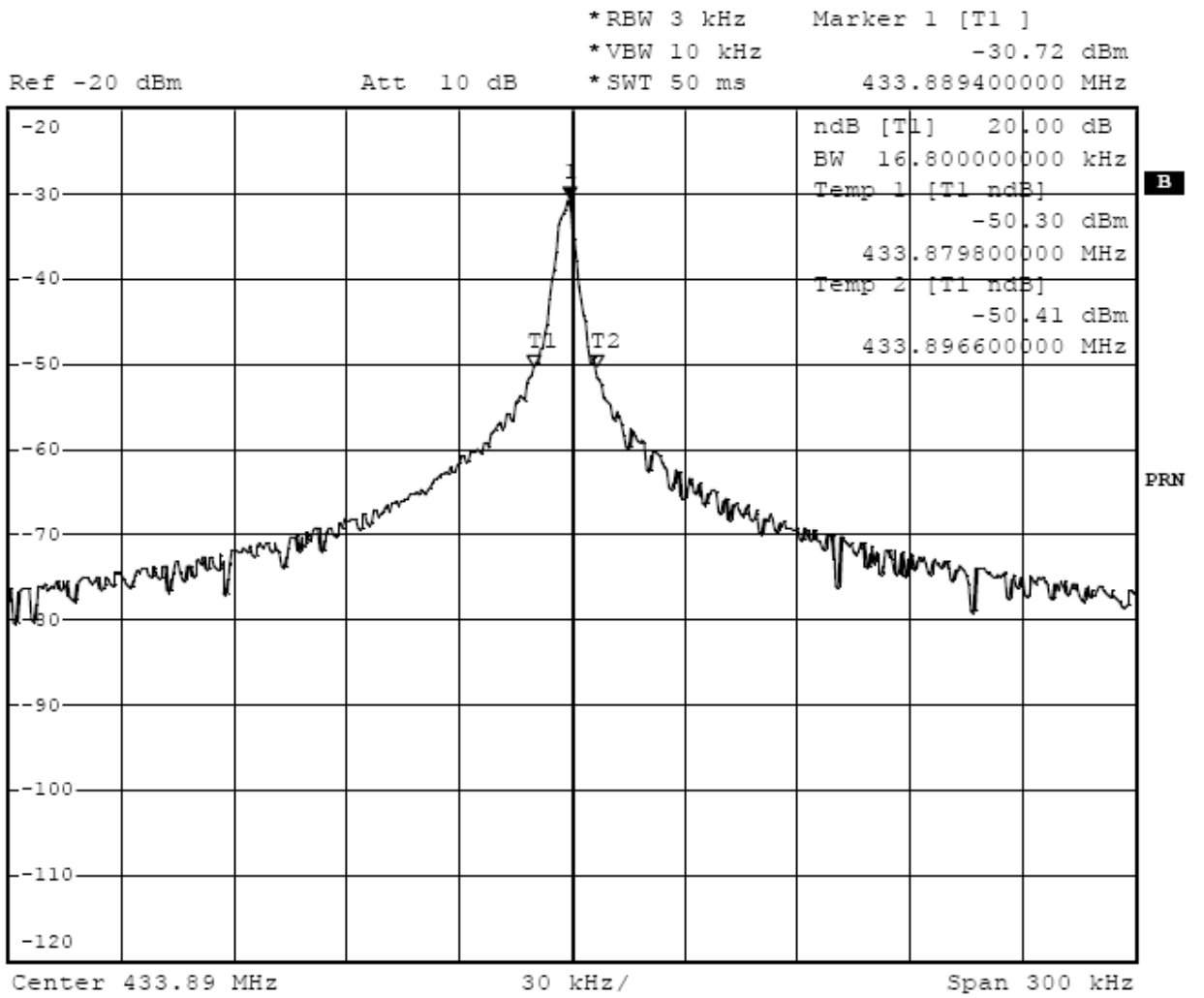
**FCC Part 15**

EUT: Wireless Indoor/Outdoor Thermometer M/N:536  
 Manufacturer: Shenzhen San Fu Da Electronics Co., Ltd.  
 Operating Condition: TX  
 Test Site: ATC EMC Lab.SAC  
 Operator: Feng  
 Test Specification: Vertical  
 Comment: DC 3V

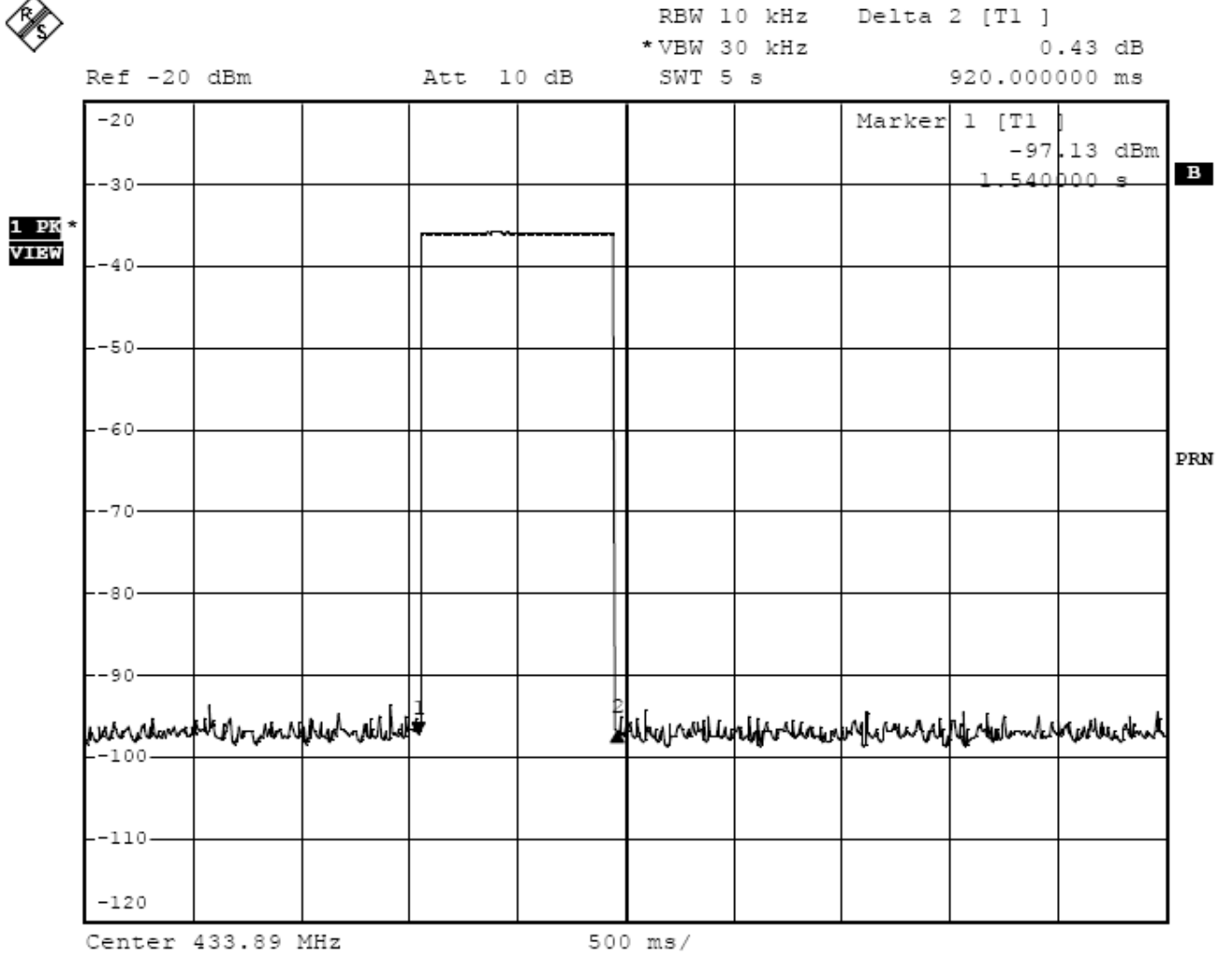


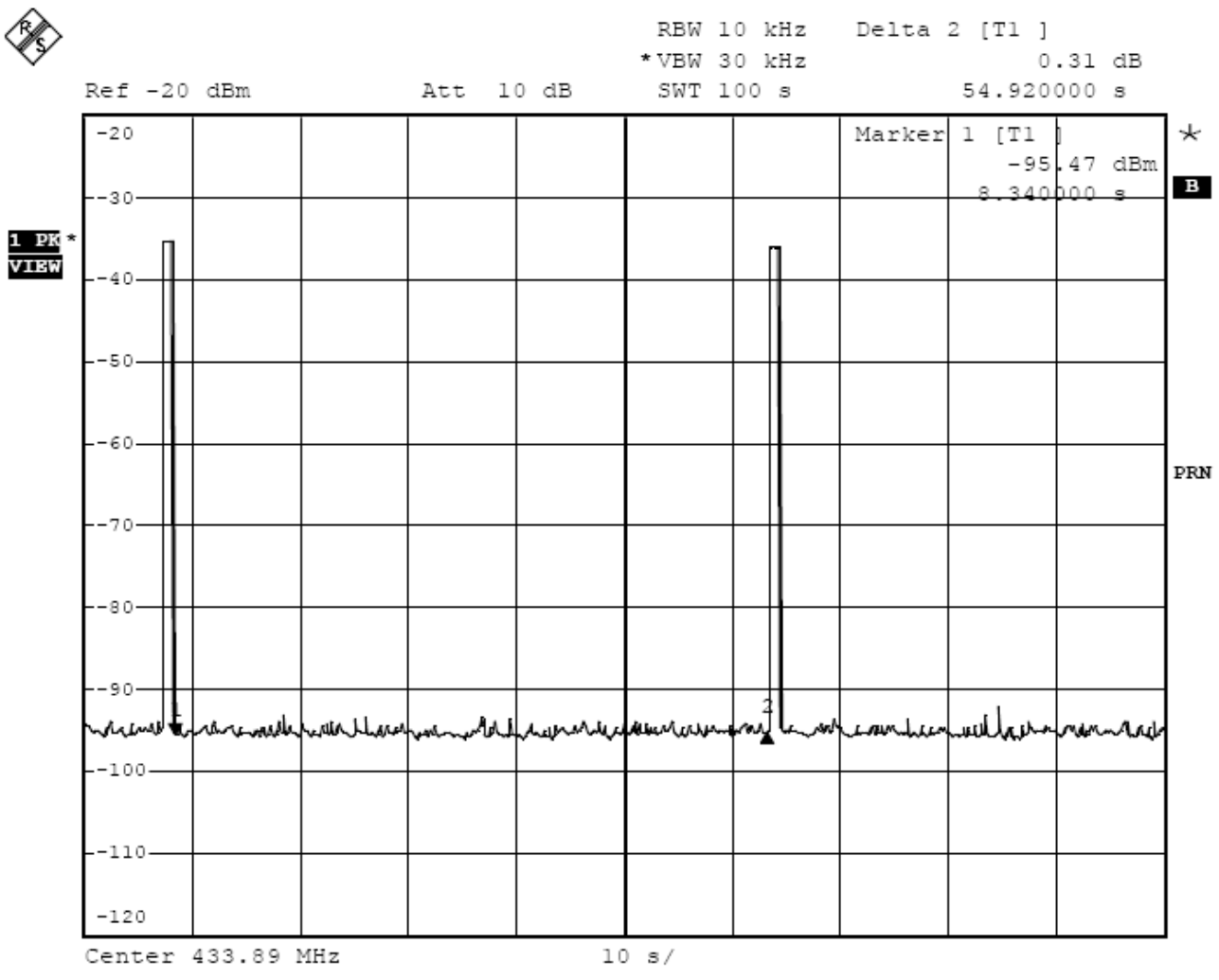


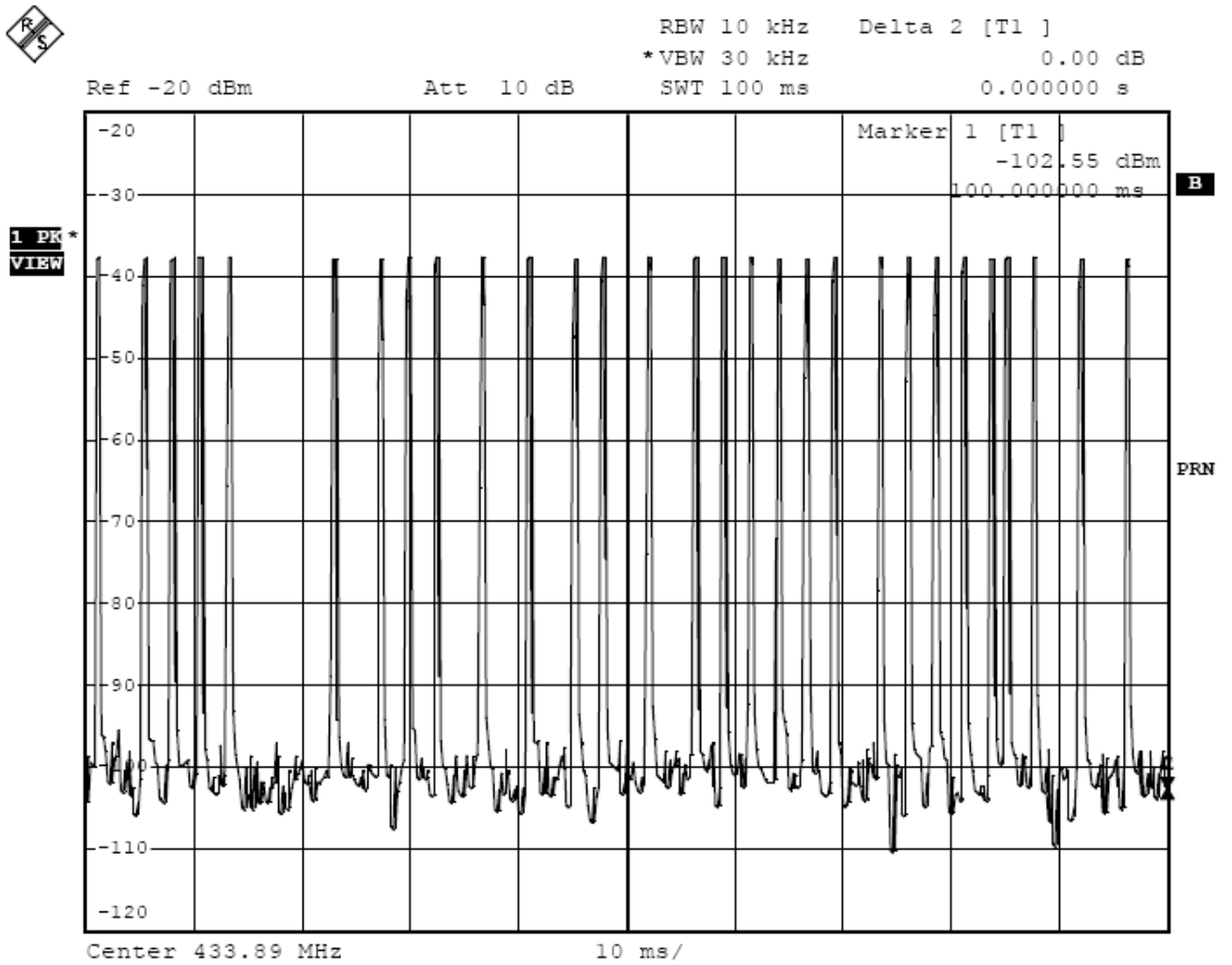
1 PK  
VIEW



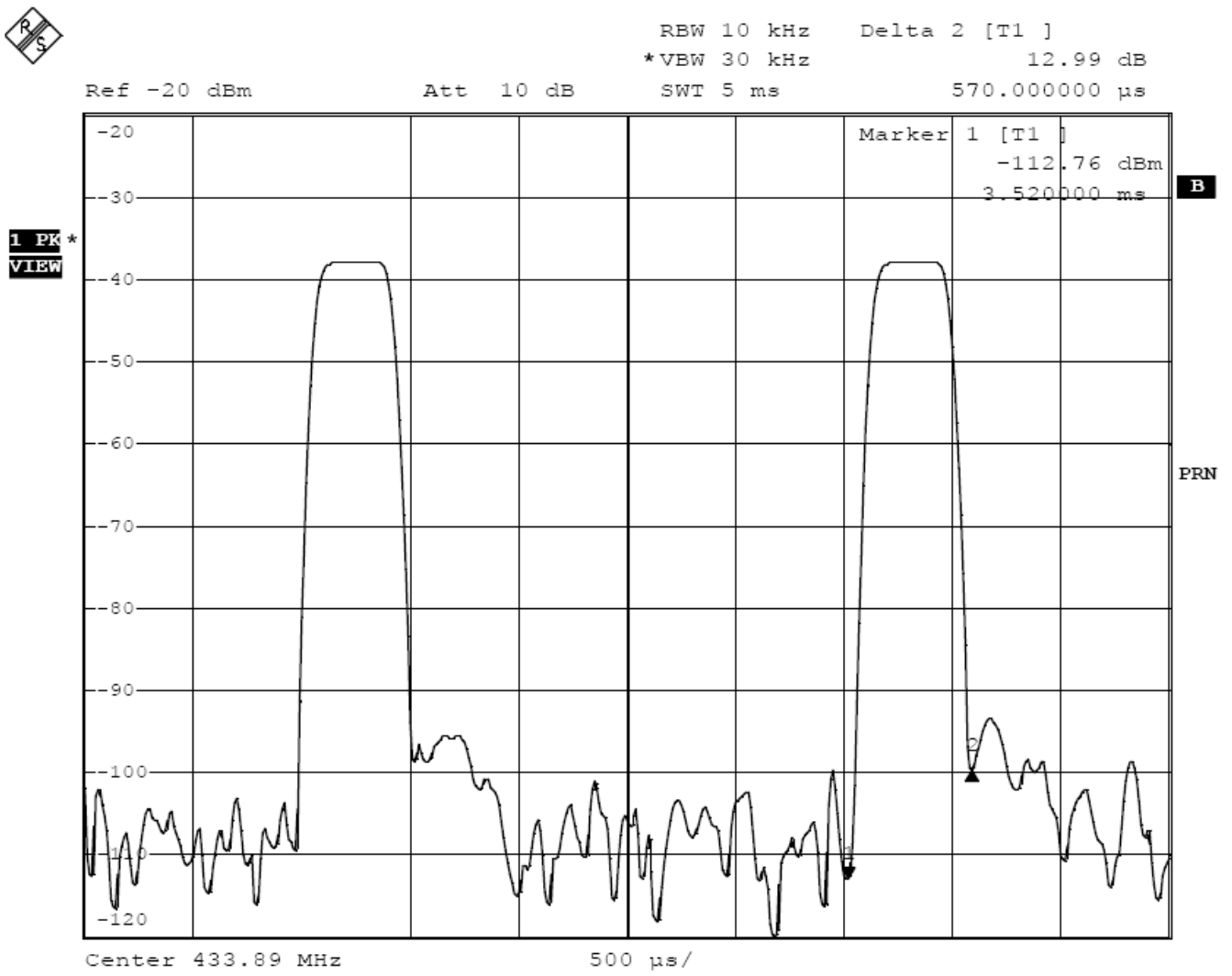








It sums of 29 'on' signals at 100ms.



The graph show the duration of 'on' signal. From marker 1 to marker 2, duration is 0.57ms.