

APPLICATION CERTIFICATION

On Behalf of
Raffel Comfort Sciences LLC

Remote Control
Model No.: SYS-3207-TE

FCC ID: VXQSYS3207TX

Prepared for : Raffel Comfort Sciences LLC
Address : N19W6723 Commerce Court Cedarburg, WI 53012, USA

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Test Report Certification

Applicant : Raffel Comfort Sciences LLC
 Manufacturer : Zhangzhou Easepal Industry Co., Ltd.
 EUT Description : Remote Control
 (A) MODEL NO.: SYS-3207-TE
 (B) SERIAL NO.: N/A
 (C) POWER SUPPLY: 2.4V DC (Ni-MH “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 : January 31, 2008

Prepared by : 
 (Engineer)

Reviewer : 
 (Quality Manager)

Approved & Authorized Signer : 
 (Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Remote Control

Model Number : SYS-3207-TE

Power Supply : 2.4V DC (Ni-MH “AAA” batteries × 2)

Operation Frequency : 433.9MHz

Applicant : Raffel Comfort Sciences LLC
Address : N19W6723 Commerce Court Cedarburg, WI 53012, USA

Manufacturer : Zhangzhou Easepal Industry Co., Ltd.
Address : No.228, Jiaosong Rd., Longchi Industrial Zone
Zhangzhou, Fujian, China

Date of sample received : December 11, 2007
Date of Test : January 31, 2008

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	01.23.2009
Bilog Antenna	Schwarzbeck	VULB9163	9163-194	03.31.2008
Bilog Antenna	Chase	CBL6112B	2591	01.23.2009
Horn Antenna	Rohde&Schwarz	HF906	100013	01.23.2009
Spectrum Analyzer	Anritsu	MS2651B	6200238856	03.31.2008
Pre-Amplifier	Agilent	8447D	2944A10619	03.31.2008
L.I.S.N.	Rohde&Schwarz	ESH3-Z5	100305	03.31.2008
L.I.S.N.	Rohde&Schwarz	ESH3-Z5	100310	03.31.2008

3. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission	N/A
Section 15.231(b)	Radiated Emission	Compliant
Section 15.231(c)	20dB Bandwidth	Compliant
Section 15.231(a)(1)	Release Time Measurement	Compliant

The product is a manually operated massage remote control transmitter.
Section 15.231 (a) (2), (3), (4) and (5) are not applicable.

4. THE FIELD STRENGTH OF RADIATED EMISSION

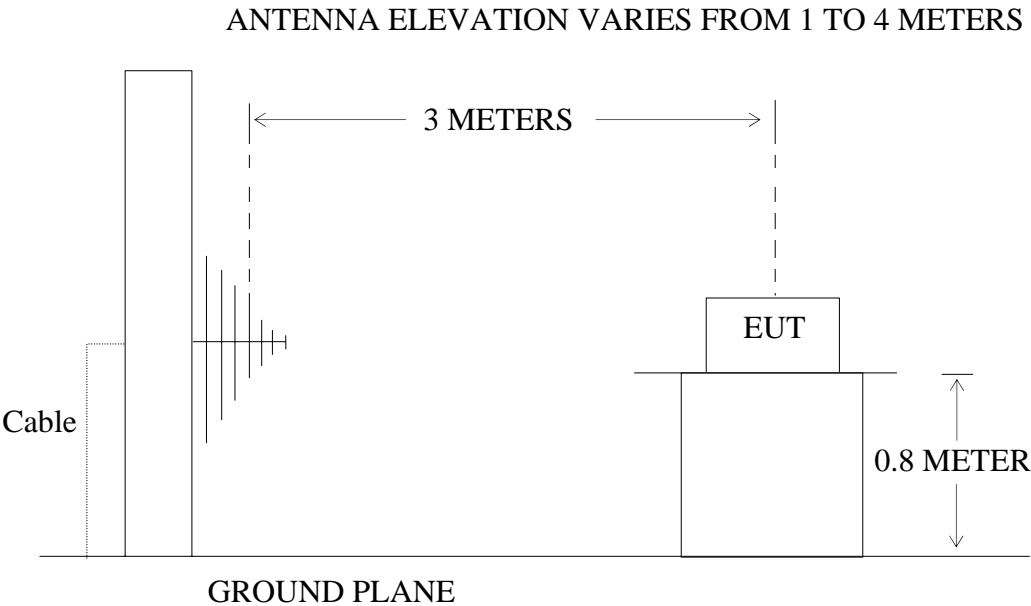
4.1. Block Diagram of Test Setup

4.1.1. Block diagram of connection between the EUT and simulators



(EUT: Remote Control)

4.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Remote Control)

4.2. The Field Strength of Radiated Emission Measurement Limits

5.2.1 Transmitter Radiation Emission Measurement Limits According to FCC Part 15 Section 15.231(b)

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μV/m]	Field Strength of Spurious Emission [Average] [μV/m]
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750	125-375
174-260	3750	375
260-470	3750-12500	375-1250

Above 470	12500	1250
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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= $56.81818(F)-6136.3636$; For the band 260-470MHz, $\mu\text{V/m}$ at 3 meters= $41.6667(F)-7083.3333$. The maximum permissible unwanted emission level is 20dB below the maximum permitted fundamental level. The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average(or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

5.2.2 Restricted Band Radiation Emission Measurement Limits According to FCC part 15 Section 15.205 and Section15.209.

4.3.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.

4.3.1. Remote Control (EUT)

Model Number : SYS-3207-TE
 Serial Number : N/A
 Manufacturer : Zhangzhou Easepal Industry Co., Ltd.

4.4.Operating Condition of EUT

- 4.4.1.Setup the EUT and simulator as shown as Section 5.1.
- 4.4.2.Turn on the power of all equipment.
- 4.4.3. Let the EUT work in measuring modes (TX) measure it.

4.5.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.

4.6. The Field Strength of Radiation Emission Measurement Results

PASS.

The frequency range 30MHz to 5000MHz is investigated.

Date of Test:	January 31, 2008	Temperature:	24°C
EUT:	Remote Control	Humidity:	50%
Model No.:	SYS-3207-TE	Power Supply:	2.4V DC (Ni-MH “AAA” batteries×2)
Test Mode:	TX	Test Engineer:	Feng

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	
433.856	86.0	-16.1	-3.5	66.4	69.9	80.8	108.8	14.4	38.9	Horizontal
433.856	83.7	-16.1	-3.5	64.1	67.6	80.8	108.8	16.7	41.2	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	
867.699	59.6	-12.1	-3.5	44.0	47.5	60.8	80.8	16.8	33.3	Horizontal
867.699	52.6	-12.1	-3.5	37.0	40.5	60.8	80.8	23.8	40.3	Vertical

Note:

1. 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:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

$$\text{Where Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$

2. FCC Limit for Average Measurement = $41.6667(433)-7083.3333 = 10958.3478\mu\text{V/m}=80.8\text{dB}\mu\text{V/m}$
3. The spectral diagrams in appendix I display the measurement of peak values.

5. 20DB OCCUPIED BANDWIDTH

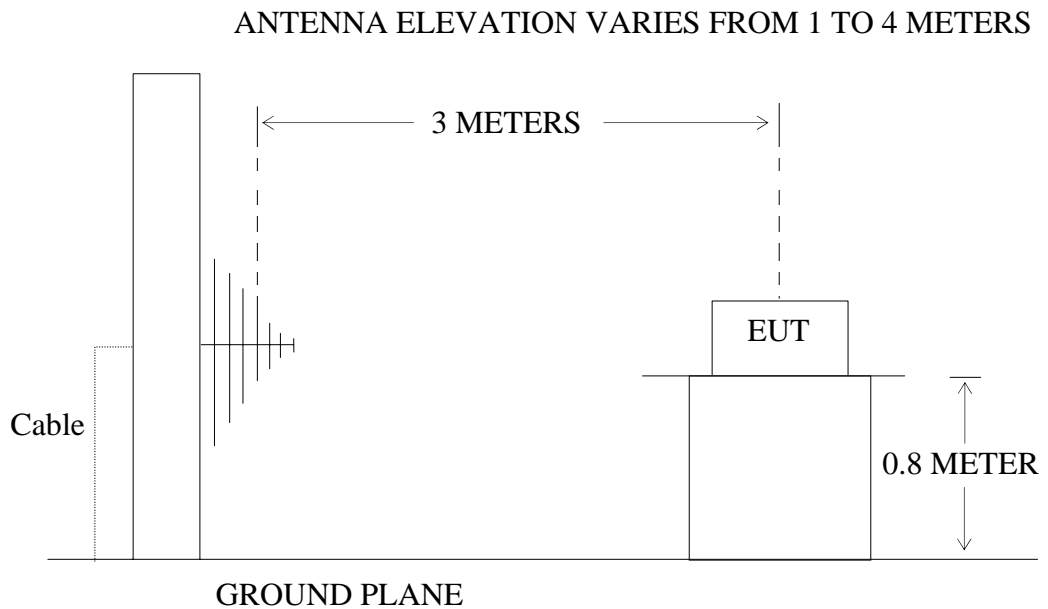
5.1. Block Diagram of Test Setup

5.1.1. Block diagram of connection between the EUT and simulators



(EUT: Remote Control)

5.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Remote Control)

5.2. 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.

5.3.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.

5.3.1. Remote Control (EUT)

Model Number : SYS-3207-TE
Serial Number : N/A
Manufacturer : Zhangzhou Easepal Industry Co., Ltd.

5.4.Operating Condition of EUT

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

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 = 1000kHz.

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

5.6. Measurement Result

The EUT does meet the FCC requirement.

-20dB bandwidth = 44.0kHz < 1082.5kHz.

The spectral diagrams in appendix I.

6. RELEASE TIME MEASUREMENT

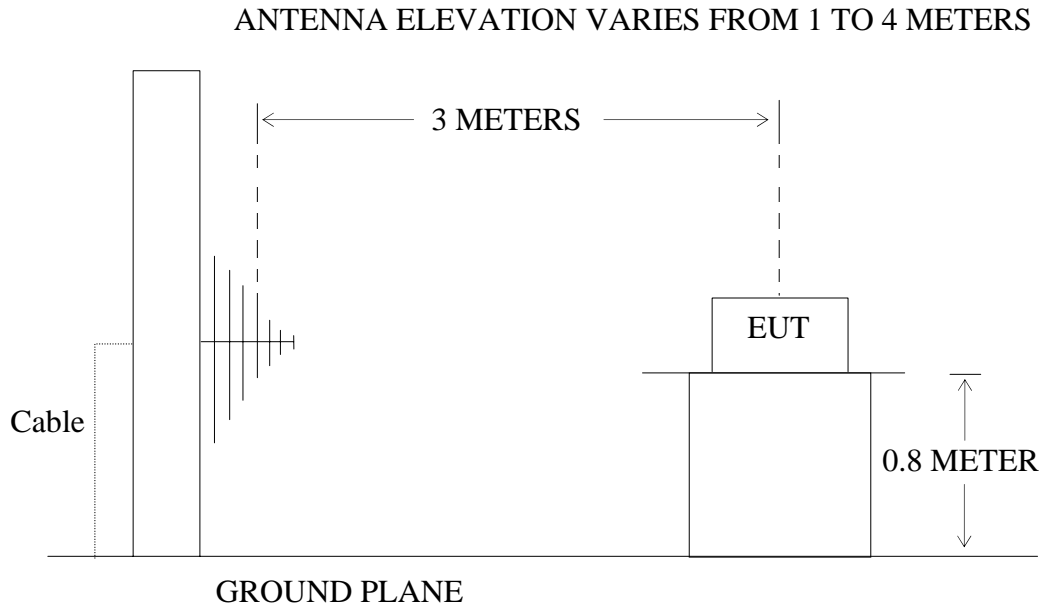
6.1. Block Diagram of Test Setup

6.1.1. Block diagram of connection between the EUT and simulators



(EUT: Remote Control)

6.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Remote Control)

6.2. Release Time Measurement According To FCC Part 15 Section 15.231(a)(1)

Section 15.231(a) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

6.3.EUT Configuration on Measurement

The following equipment are installed on Release Time 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. Remote Control (EUT)

Model Number : SYS-3207-TE
Serial Number : N/A
Manufacturer : Zhangzhou Easepal Industry Co., Ltd.

6.4.Operating Condition of EUT

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

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. Set SPA Center Frequency = Fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span = 0Hz. Sweep time = 10seconds.

6.5.2. Set EUT as normal operation and press Transmitter button.

6.5.3. Set SPA View. Delta Mark time.

6.6. Measurement Result

The release time less than 5 seconds.

Release Time= 4.32seconds

The spectral diagrams in appendix I.

7. AVERAGE FACTOR MEASUREMENT

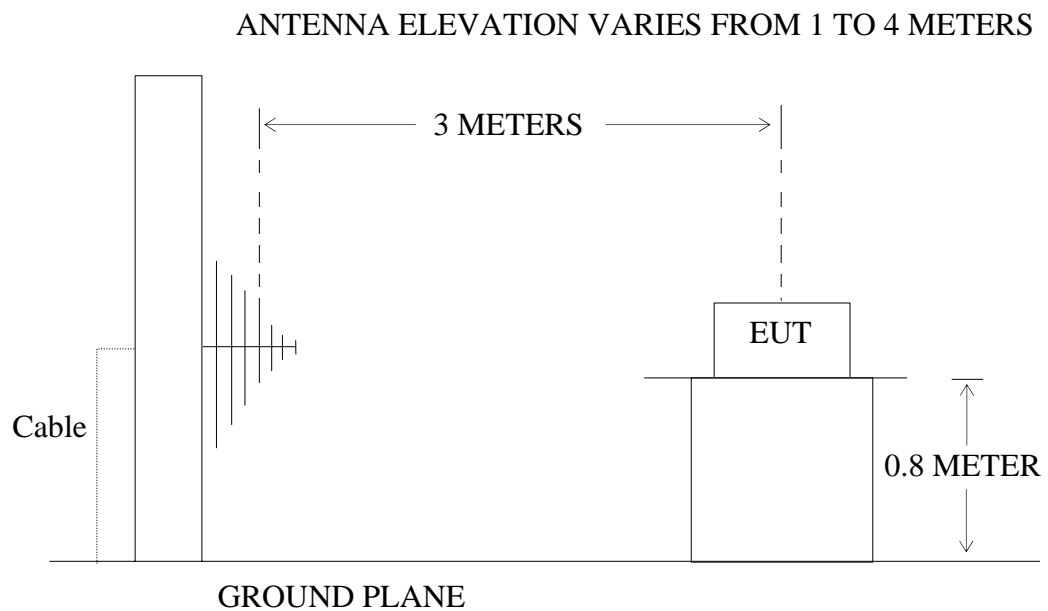
7.1. Block Diagram of Test Setup

7.1.1. Block diagram of connection between the EUT and simulators



(EUT: Remote Control)

7.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Remote Control)

7.2. 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 = $20 \log (\text{duty cycle})$

7.3.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.

7.3.1. Remote Control (EUT)

Model Number : SYS-3207-TE
Serial Number : N/A
Manufacturer : Zhangzhou Easepal Industry Co., Ltd.

7.4.Operating Condition of EUT

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

7.4.2.Turn on the power of all equipment.

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

7.5.Test Procedure

7.5.1.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.

7.5.2. Set SPA Center Frequency = Fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span = 0Hz.

7.5.3. Set EUT as normal operation.

7.5.4. Set SPA View. Delta Mark time.

7.6. Measurement Result

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

The duration of one cycle = 100.0ms

Effective period of the cycle = $(1 \times 10.08) + (1 \times 5.46) + (12 \times 2.46) + (17 \times 1.46)$ ms
 $= 66.48$ ms

DC = $66.48\text{ms}/100\text{ms} = 0.6648$

Therefore, the average factor is found by $20\log 0.6648 = -3.5\text{dB}$

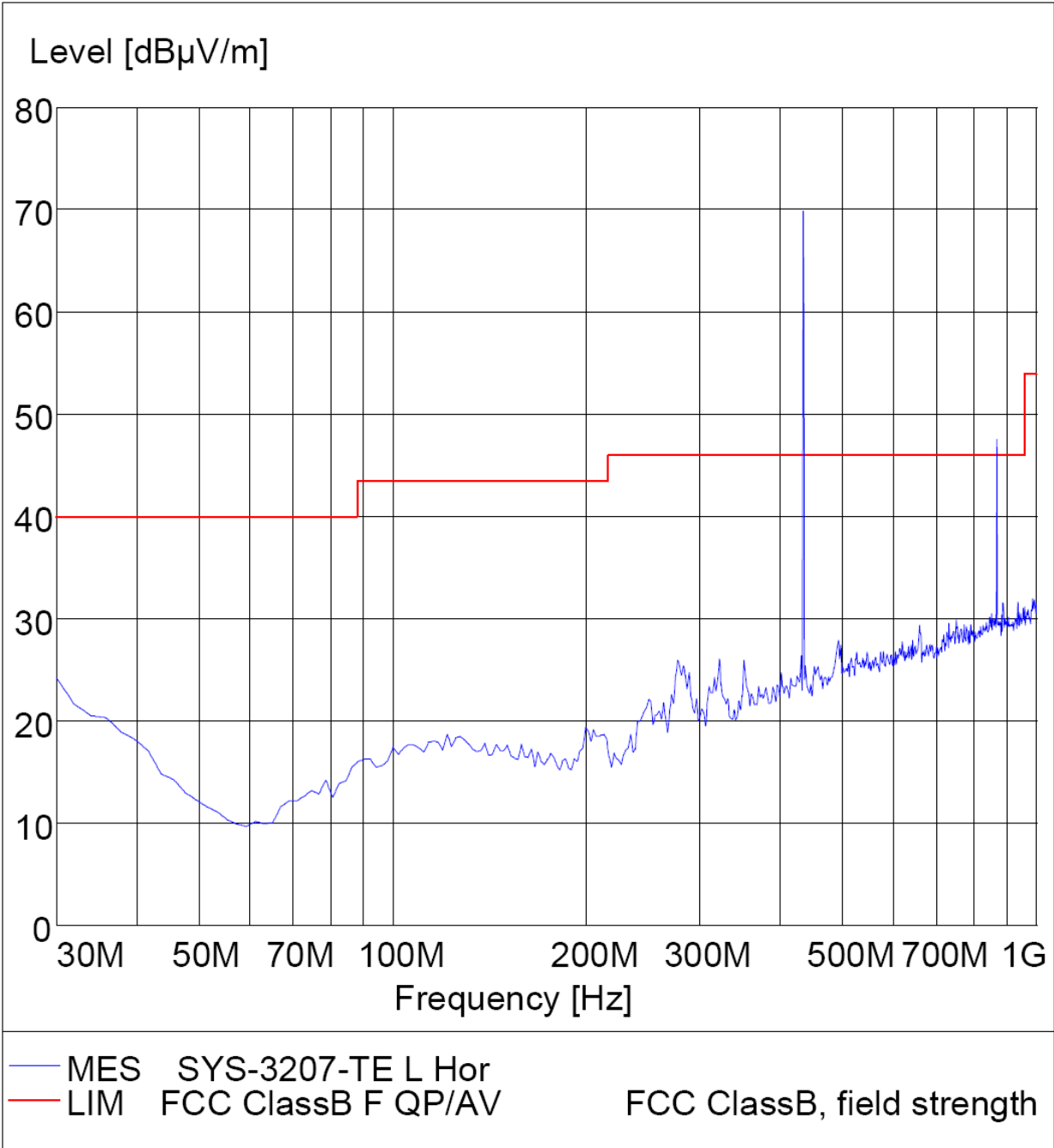
The spectral diagrams in appendix I.

APPENDIX I (Test Curves)

Radiated Disturbance

FCC Part 15

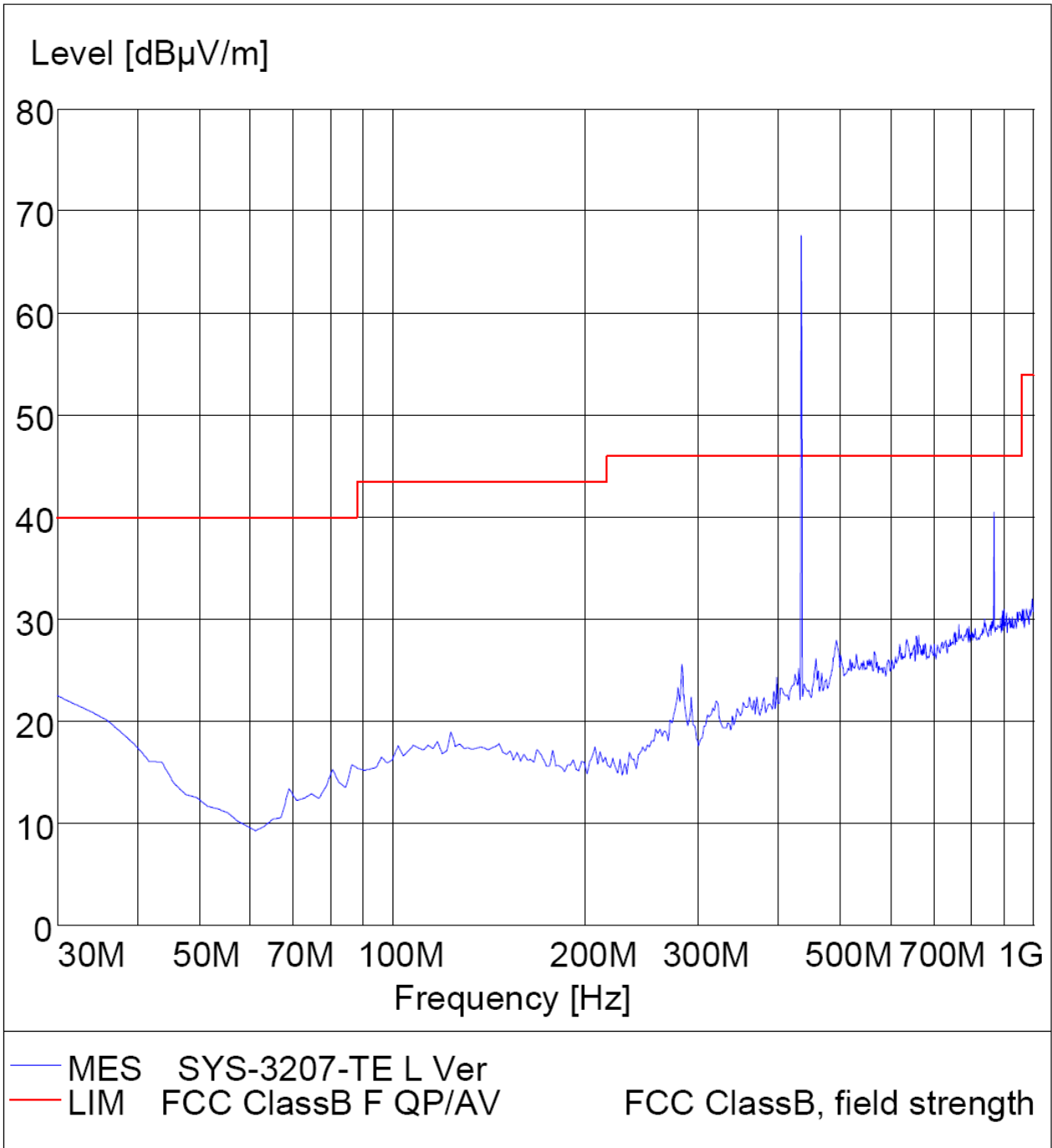
EUT: Remote Control M/N: SYS-3207-TE
Manufacturer: Zhangzhou Easepal Industry Co.,Ltd.
Operating Condition: TX
Test Site: ATC EMC Lab.SAC
Test Specification: Horizontal
Comment : DC 2.4V



Radiated Disturbance

FCC Part 15

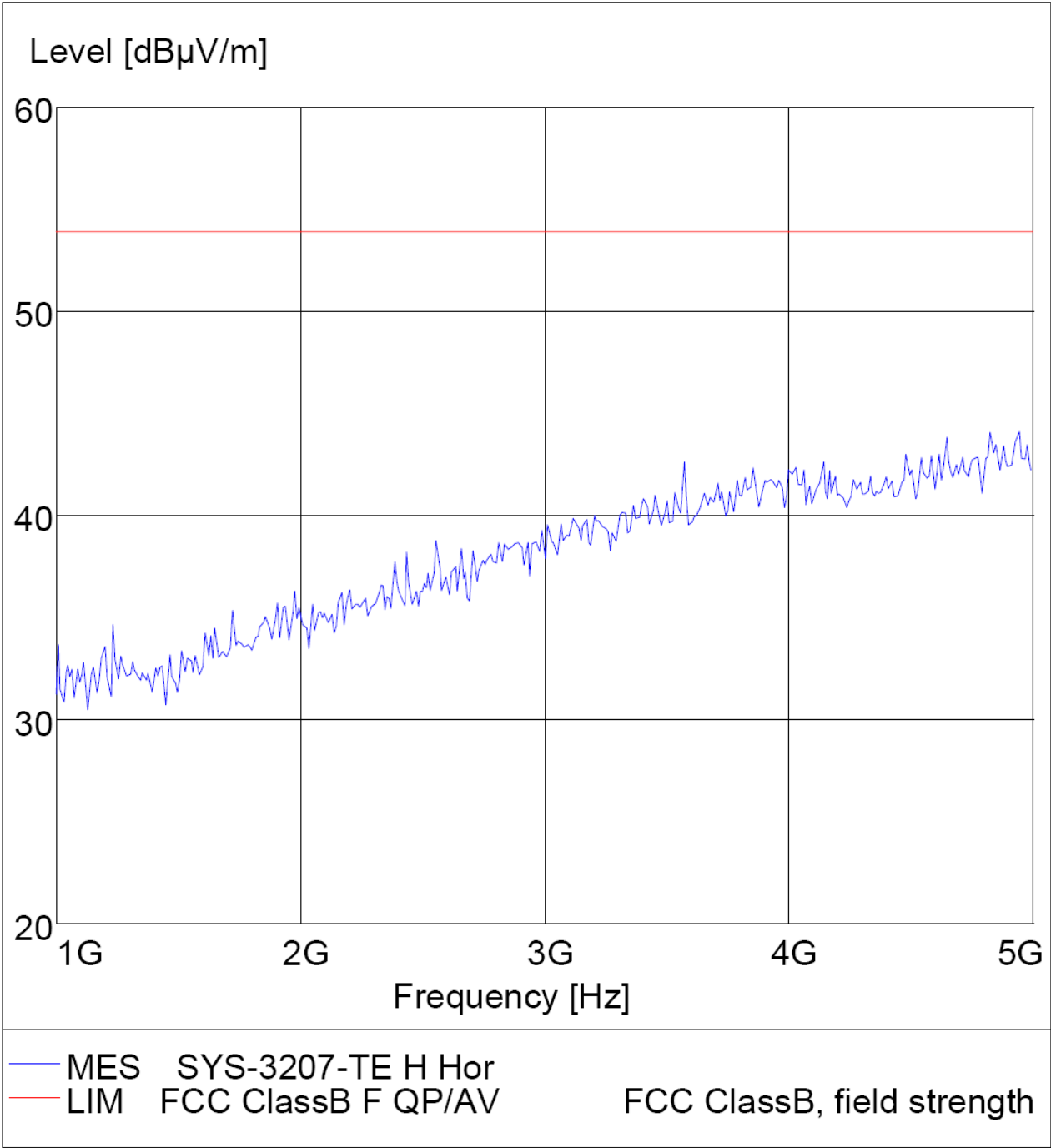
EUT: Remote Control M/N: SYS-3207-TE
Manufacturer: Zhangzhou Easepal Industry Co.,Ltd.
Operating Condition: TX
Test Site: ATC EMC Lab.SAC
Test Specification: Vertical
Comment : DC 2.4V



Radiated Disturbance

FCC Part 15

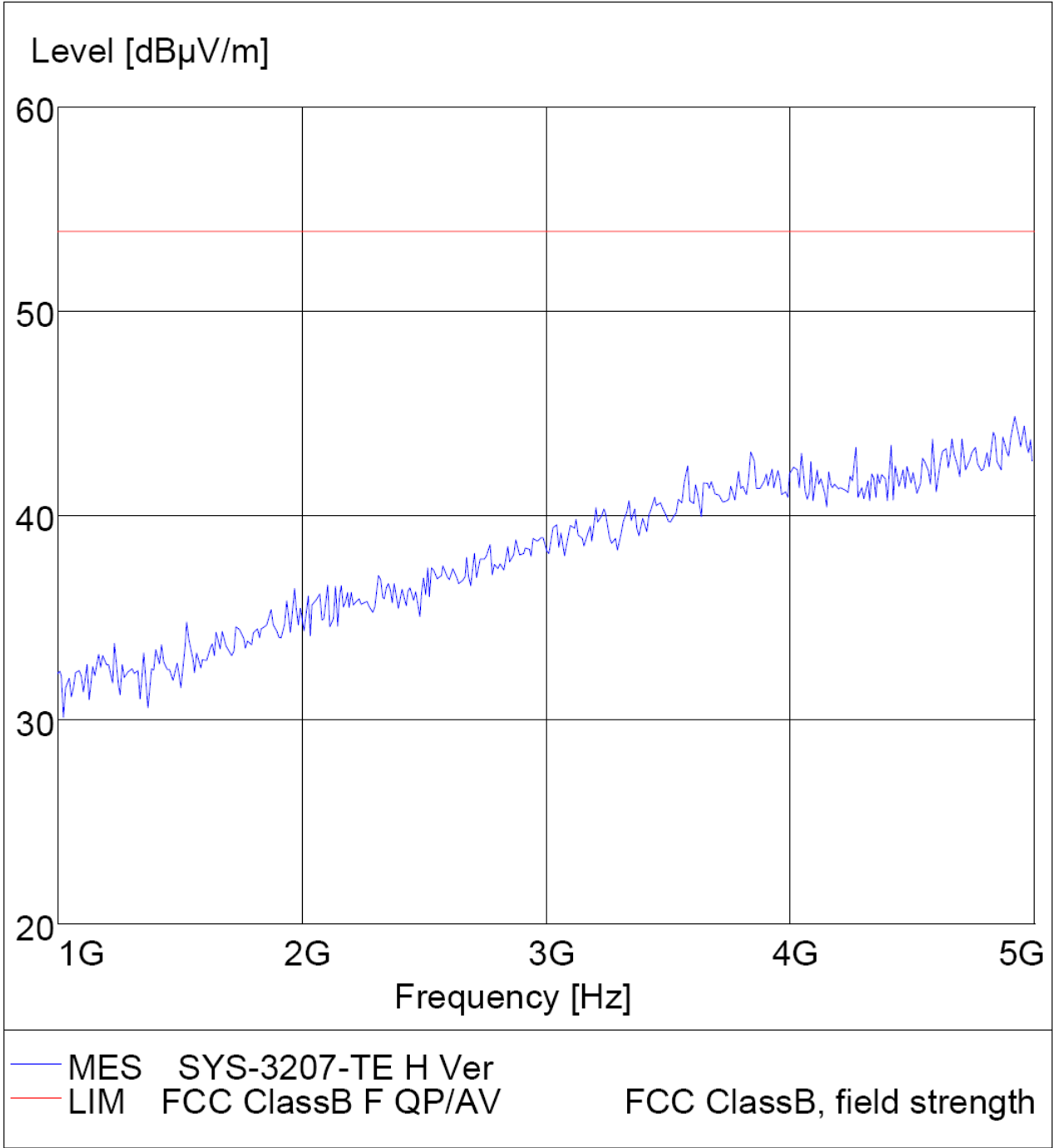
EUT: Remote Control M/N: SYS-3207-TE
Manufacturer: Zhangzhou Easepal Industry Co.,Ltd.
Operating Condition: TX
Test Site: ATC EMC Lab.SAC
Test Specification: Horizontal
Comment : DC 2.4V



Radiated Disturbance

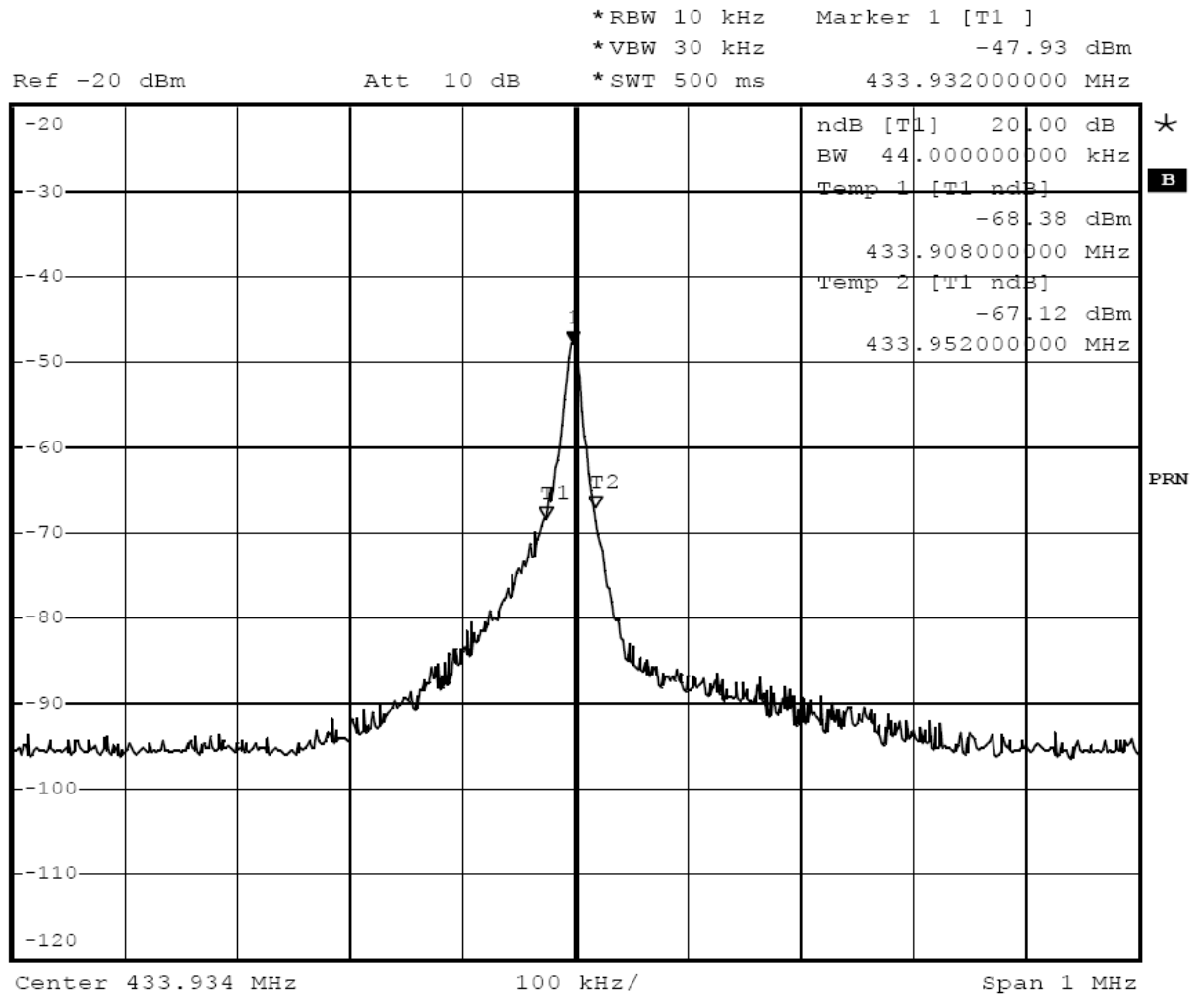
FCC Part 15

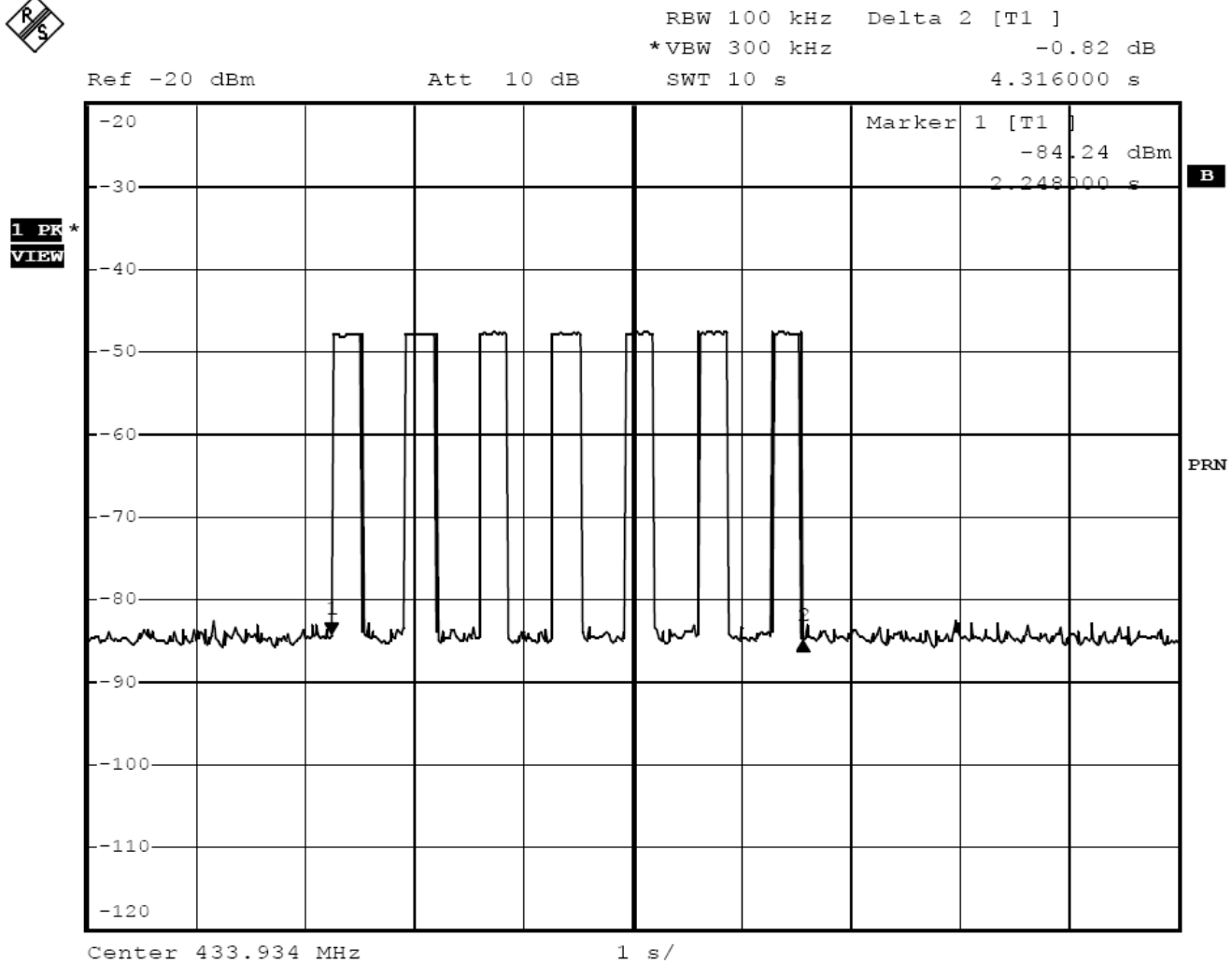
EUT: Remote Control M/N: SYS-3207-TE
Manufacturer: Zhangzhou Easepal Industry Co.,Ltd.
Operating Condition: TX
Test Site: ATC EMC Lab.SAC
Test Specification: Vertical
Comment : DC 2.4V



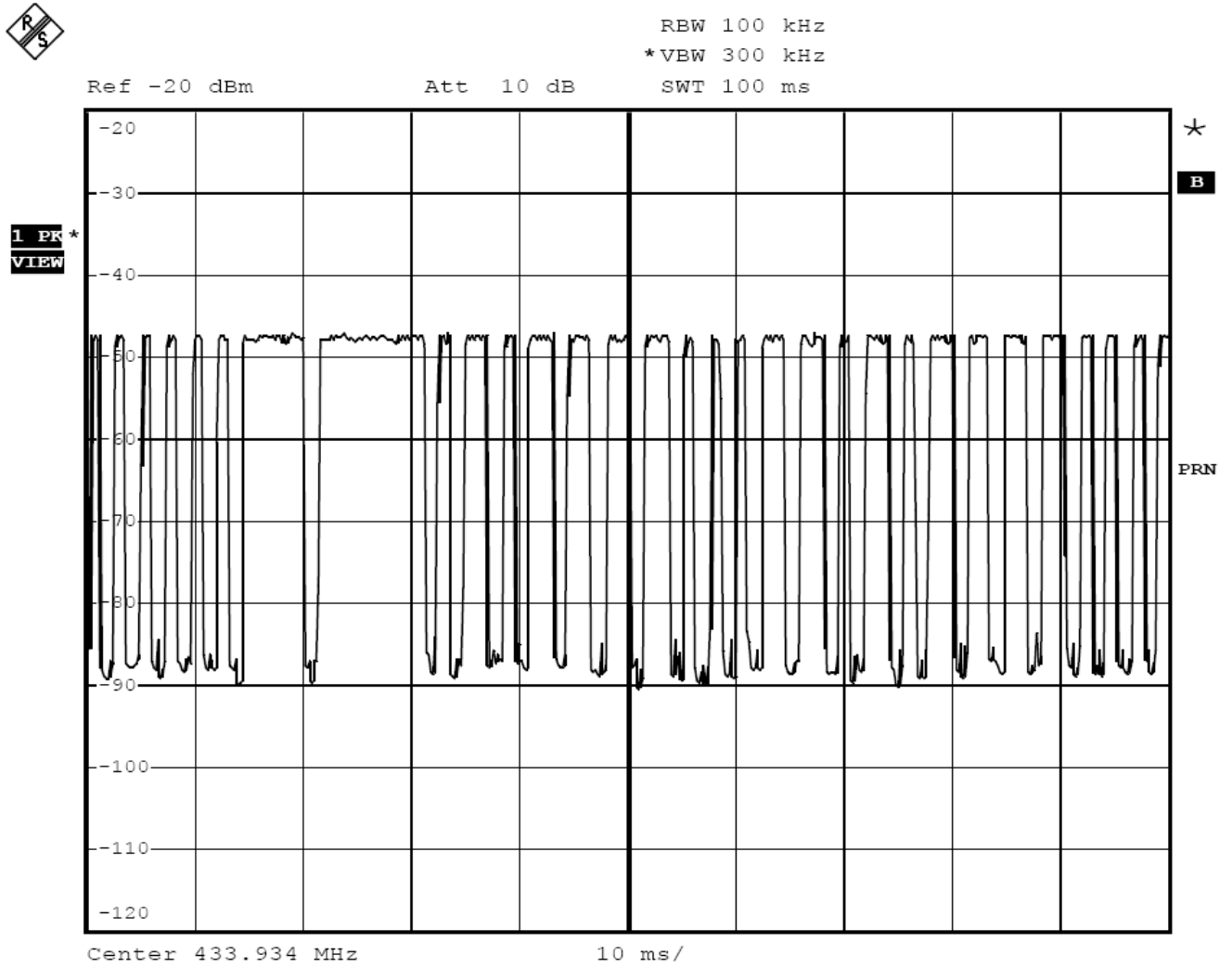


1 PK
VIEW

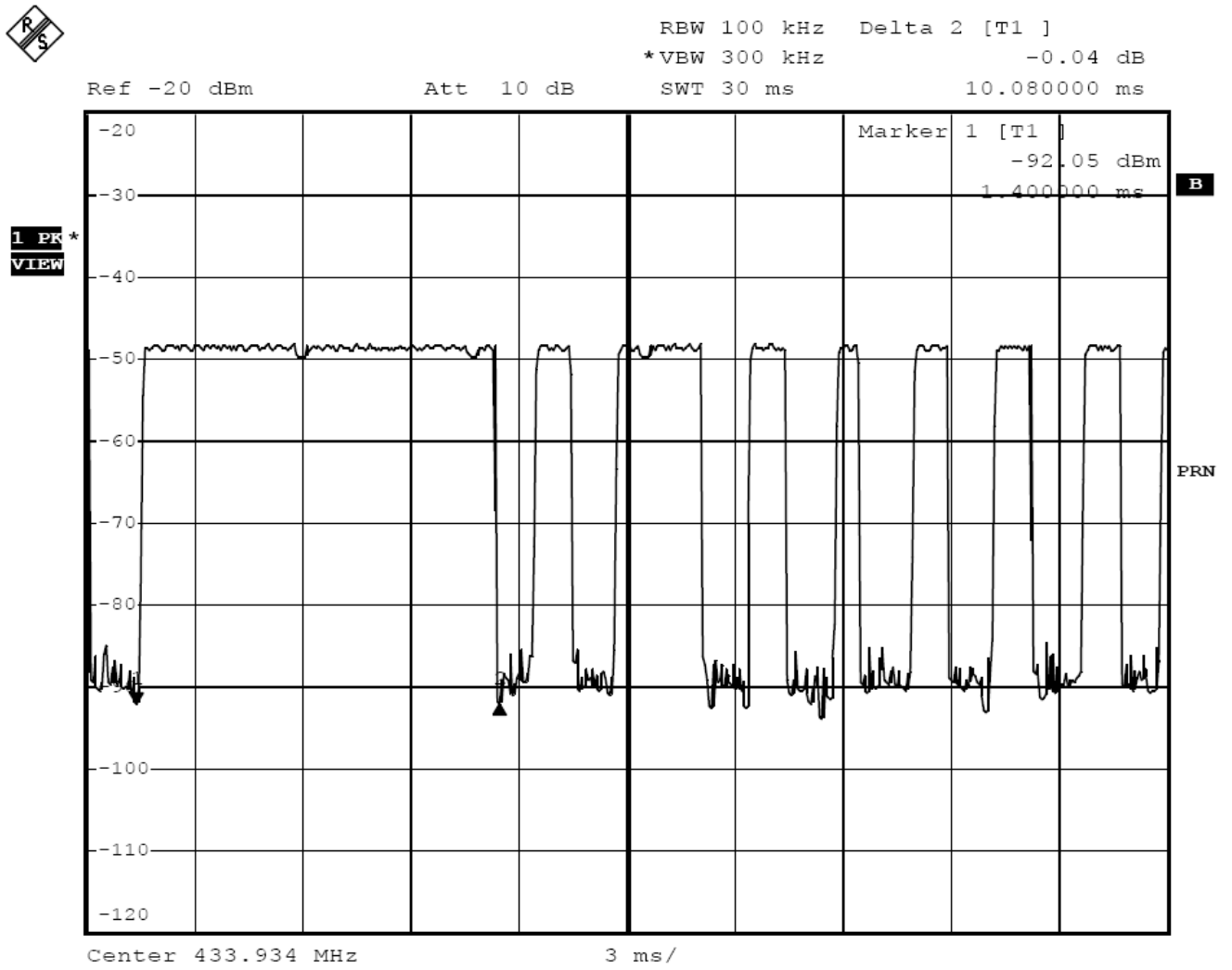




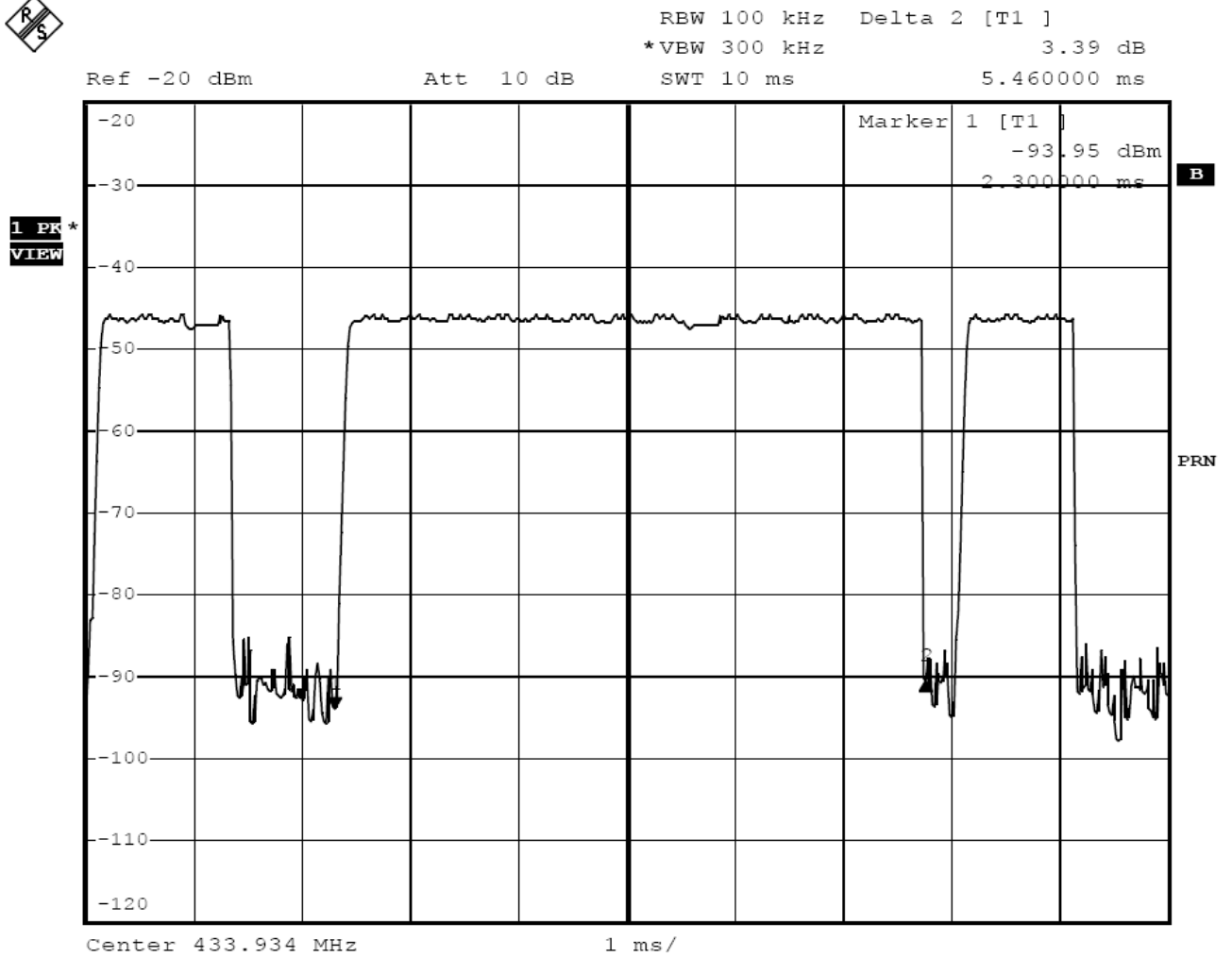
The release time is 4.32s.



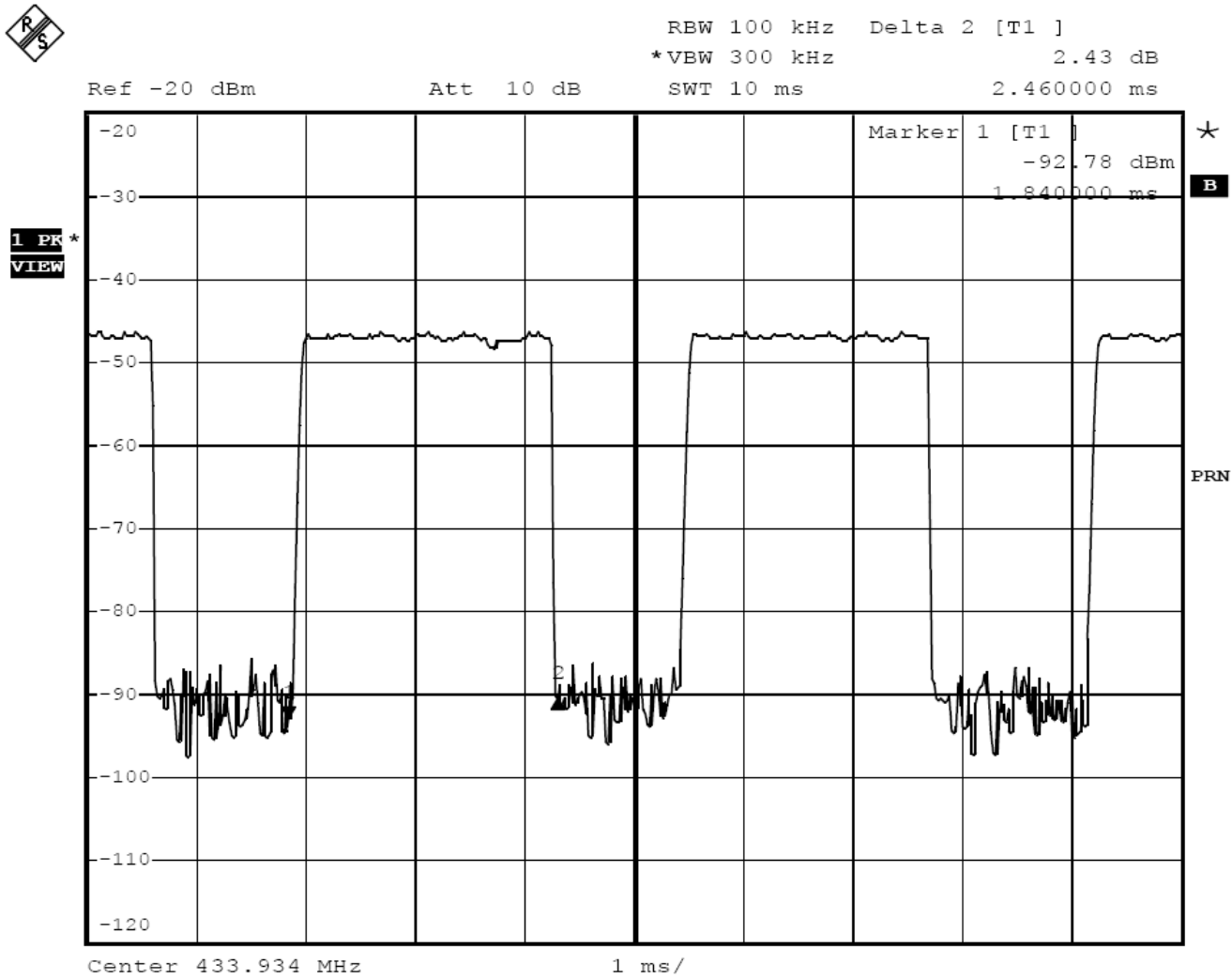
The graph shows the pattern of coding during the signal transmission.
It sums of 1 longest 'on' signal, 1 long 'on' signal, 12 middle 'on' signals and 17 short 'on' signals.



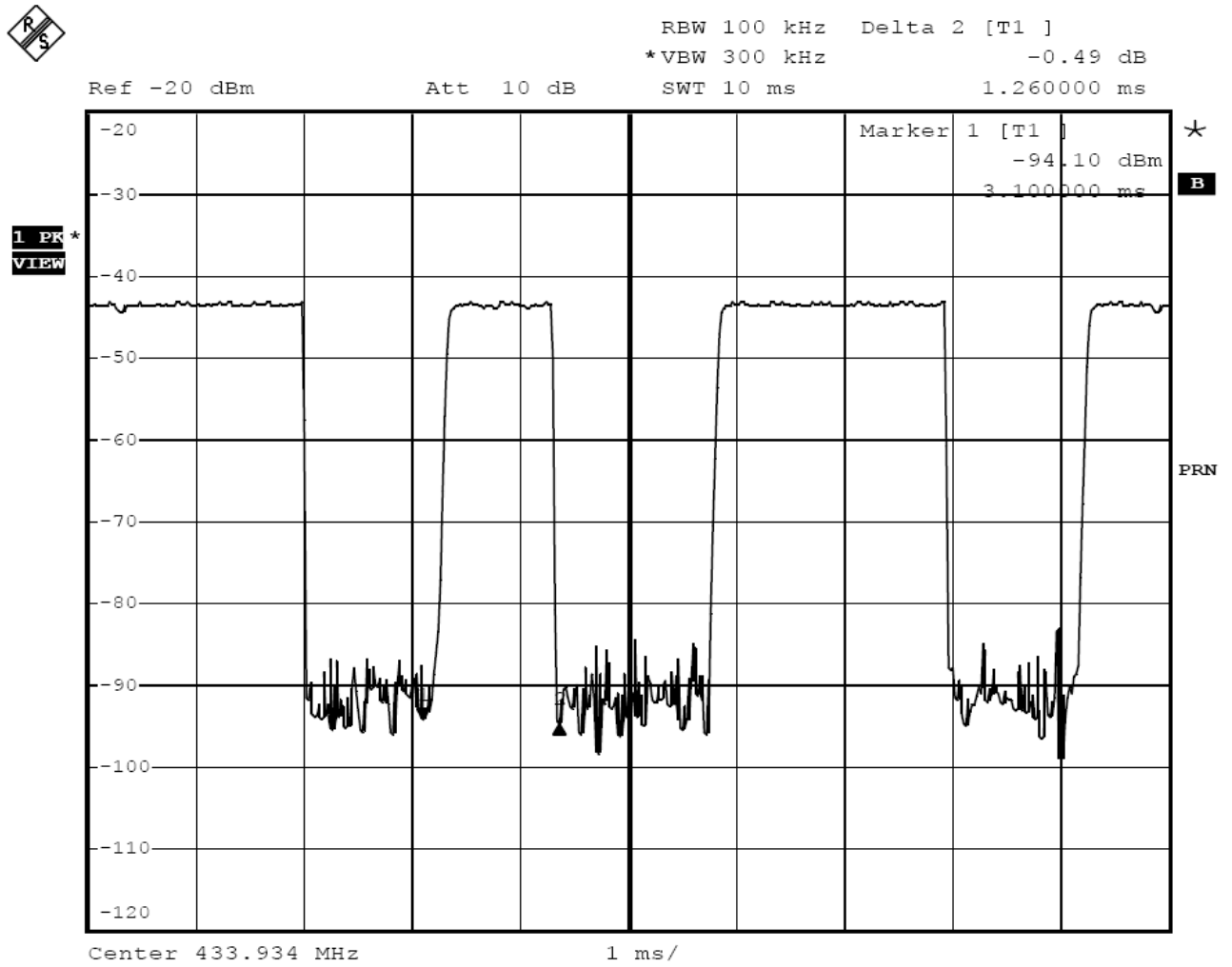
The graph show the duration of longest 'on' signal. From marker 1 to marker 2, duration is 10.08ms.



The graph show the duration of long 'on' signal. From marker 1 to marker 2, duration is 5.46ms.



The graph show the duration of middle 'on' signal. From marker 1 to marker 2, duration is 2.46ms.



The graph show the duration of short 'on' signal. From marker 1 to marker 2, duration is 1.26ms.