

APPLICATION CERTIFICATION

On Behalf of
Formation Limited

Outdoor Sensor
Model No.: STX7500

FCC ID: UU7DCTX4

Prepared for : Formation Limited
Address : Suit 915-918, 9/F Corporation Square, 8 Lam Lok St.
Kowloon Bay, Kowloon, Hong Kong

Prepared by : ACCURATE TECHNOLOGY CO. LTD
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Report Number : ATE20070808
Date of Test : April 05, 2007
Date of Report : April 12, 2007

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Test Report Certification

Applicant : Formation Limited
 Manufacturer : Carrin Electronics Co., Ltd.
 EUT Description : Outdoor Sensor
 (A) MODEL NO.: STX7500
 (B) SERIAL NO.: N/A
 (C) POWER SUPPLY: DC 3.0V (AA Battery ×2)

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.231: 2006 & 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 : April 05, 2007

Prepared by : 
 (Engineer)

Reviewer : 
 (Quality Manager)

Approved & Authorized Signer : 
 (Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Outdoor Sensor

Model Number : STX7500

Memo : This device is a transmitter

Power Supply : DC 3.0V(AA Battery ×2)

Applicant : Formation Limited
Address : Suit 915-918, 9/F Corporation Square, 8 Lam Lok St.
Kowloon Bay, Kowloon, Hong Kong

Manufacturer : Carrin Electronics Co., Ltd.
Address : Unit 2105-2106, Tower A, Regent Centre, 63 Wo Yi Hop Rd., Kwai Chung, N.T., Hong Kong

Date of sample received : April 02, 2007
Date of Test : April 05, 2007

1.2. Description of Test Facility

EMC Lab : Accredited by TUV Rheinland Shenzhen, May 10, 2004
Accredited by FCC, May 10, 2004
The Certificate Registration Number is 253065
Accredited by Industry Canada, May 18, 2004
The Certificate Registration Number is IC 5077

Name of Firm : ACCURATE TECHNOLOGY CO. LTD
Site Location : F1, Bldg. A, Changyuan New Material Port, Keyuan Rd.
Science & Industry Park, Nanshan, Shenzhen, Guangdong
P.R. China

1.3. Measurement Uncertainty

Conducted emission expanded uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty = 4.12dB, 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

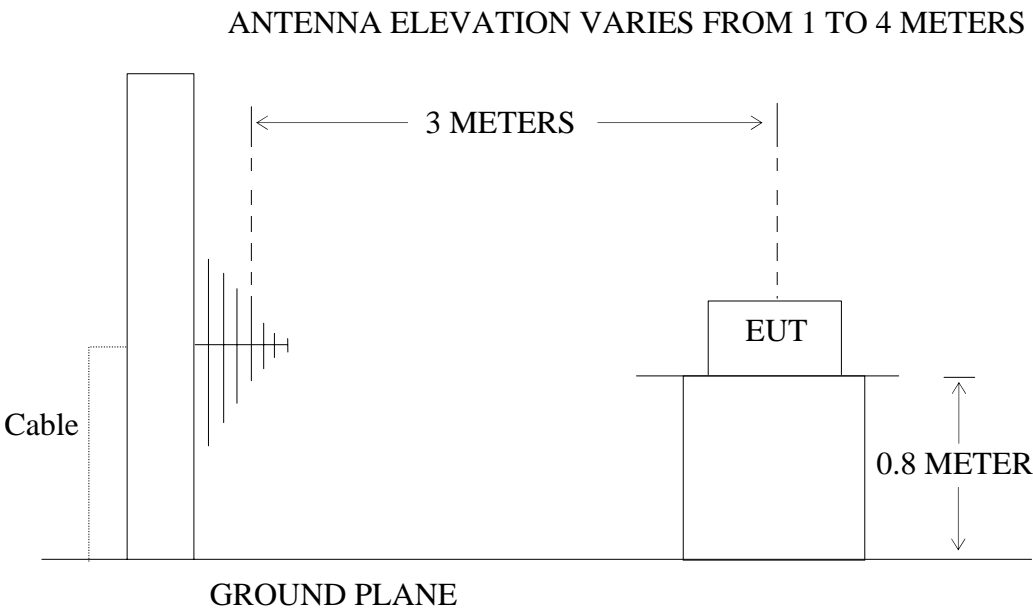
3.1. Block Diagram of Test Setup

3.1.1. Block diagram of connection between the EUT and simulators



(EUT: Outdoor Sensor)

3.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Outdoor Sensor)

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. Outdoor Sensor (EUT)

| | | |
|---------------|---|------------------------------|
| Model Number | : | STX7500 |
| Serial Number | : | N/A |
| Manufacturer | : | Carrin 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>April 05, 2007</u> | Temperature: | <u>26°C</u> |
| EUT: | <u>Outdoor Sensor</u> | Humidity: | <u>57%</u> |
| Model No.: | <u>STX7500</u> | Power Supply: | <u>DC 3.0V(AA Battery × 2)</u> |
| Test Mode: | <u>TX</u> | Test Engineer: | <u>Andy</u> |

| 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 | |
| 433.912 | 67.6 | -16.1 | -17.0 | 34.5 | 51.5 | 72.8 | 92.8 | 38.3 | 41.3 | Horizontal |
| *1301.774 | 38.6 | -7.2 | -17.0 | 14.4 | 31.4 | 54 | 74 | 39.6 | 42.6 | |
| 433.912 | 65.1 | -16.1 | -17.0 | 32.0 | 49.0 | 72.8 | 92.8 | 40.8 | 43.8 | Vertical |
| *135.503 | 52.8 | -21.2 | -17.0 | 14.6 | 31.6 | 54 | 74 | 39.4 | 42.4 | |
| *1301.774 | 37.0 | -7.2 | -17.0 | 12.8 | 29.8 | 54 | 74 | 41.2 | 44.2 | |

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:

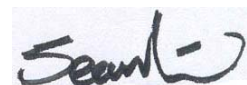
Result = Reading + Corrected Factor

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

3. FCC Limit for Average Measurement = $16.6667(433.912) - 2833.3333 = 4398.5478\mu\text{V/m} = 72.8\text{dB}\mu\text{V/m}$

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

Reviewer :



4. 20DB OCCUPIED BANDWIDTH

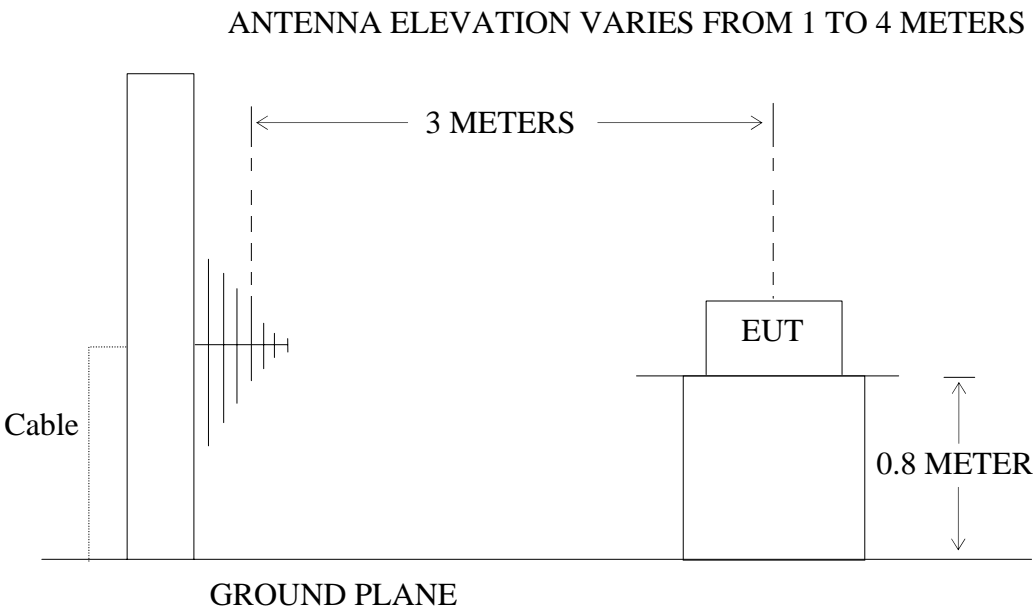
4.1. Block Diagram of Test Setup

4.1.1. Block diagram of connection between the EUT and simulators



(EUT: Outdoor Sensor)

4.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Outdoor Sensor)

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.Outdoor Sensor (EUT)

Model Number : STX7500
Serial Number : N/A
Manufacturer : Carrin 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 = 10kHz, VBW = 10kHz, Span = 300kHz.

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

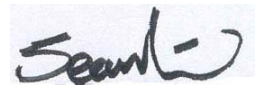
4.6. Measurement Result

The EUT does meet the FCC requirement.

-20dB bandwidth = 46.2KHz < 1082.5KHz.

The spectral diagrams in appendix I.

Reviewer :

A handwritten signature in black ink, appearing to read "Sean", is written over a light blue rectangular background. The signature is stylized with a large, sweeping "S" and a checkmark-like flourish at the end.

5. DURATION TIME AND SILENT PERIOD MEASUREMENT

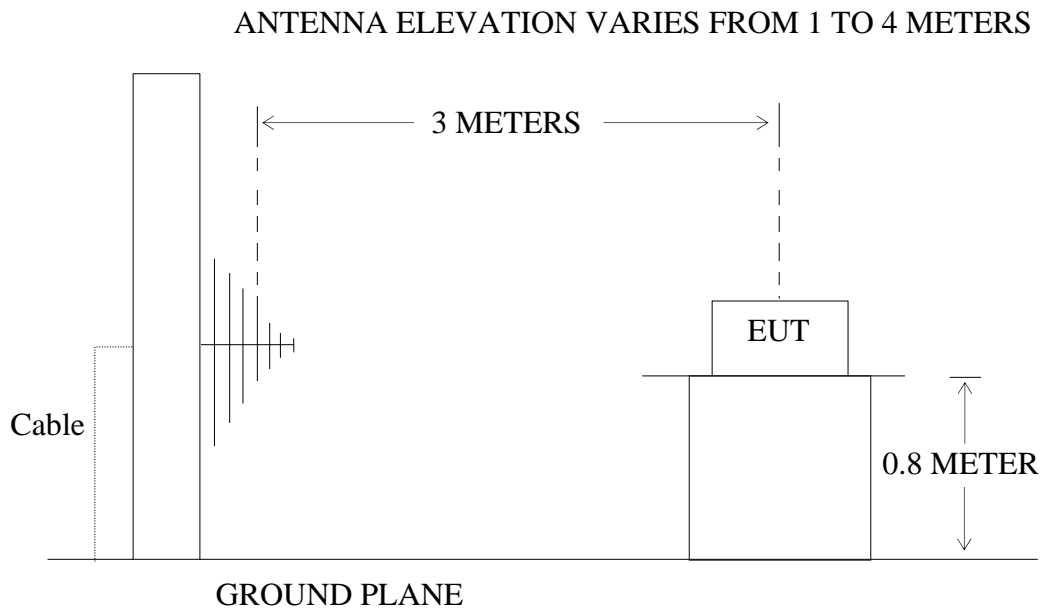
5.1. Block Diagram of Test Setup

5.1.1. Block diagram of connection between the EUT and simulators



(EUT: Outdoor Sensor)

5.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Outdoor Sensor)

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.Outdoor Sensor (EUT)

Model Number : STX7500
Serial Number : N/A
Manufacturer : Carrin 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 = 100kHz,
VBW =100kHz, Span = 0Hz.

5.5.2. Set EUT as normal operation.

5.5.3. Set SPA View. Delta Mark time.

5.6. Measurement Result

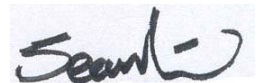
The EUT does meet the FCC requirement.

Duration time = 0.963 second < 1 second

Silent period = 31.08 seconds > 30 times the duration of the transmission > 10seconds

The spectral diagrams in appendix I.

Reviewer :

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6. AVERAGE FACTOR MEASUREMENT

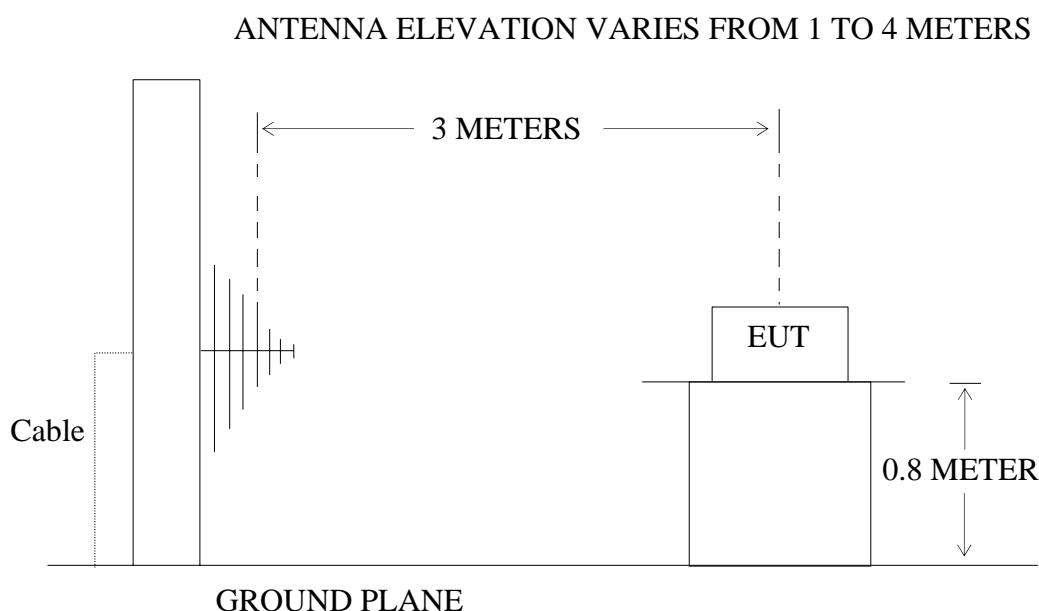
6.1. Block Diagram of Test Setup

6.1.1. Block diagram of connection between the EUT and simulators



(EUT: Outdoor Sensor)

6.1.2. Anechoic Chamber Test Setup Diagram



(EUT: Outdoor Sensor)

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.Outdoor Sensor (EUT)

Model Number : STX7500
Serial Number : N/A
Manufacturer : Carrin Electronics 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. 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 = 100kHz, VBW =100kHz, 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

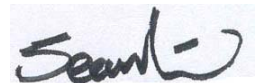
Sum of pulse width = $32 \times 0.44 \text{ ms} = 14.08 \text{ ms}$

Duty Cycle = $14.08 \text{ ms} / 100 \text{ ms} = 0.1408$

Therefore, the average factor is found by $20 \log 0.1408 = -17.0 \text{ dB}$

The spectral diagrams in appendix I.

Reviewer :

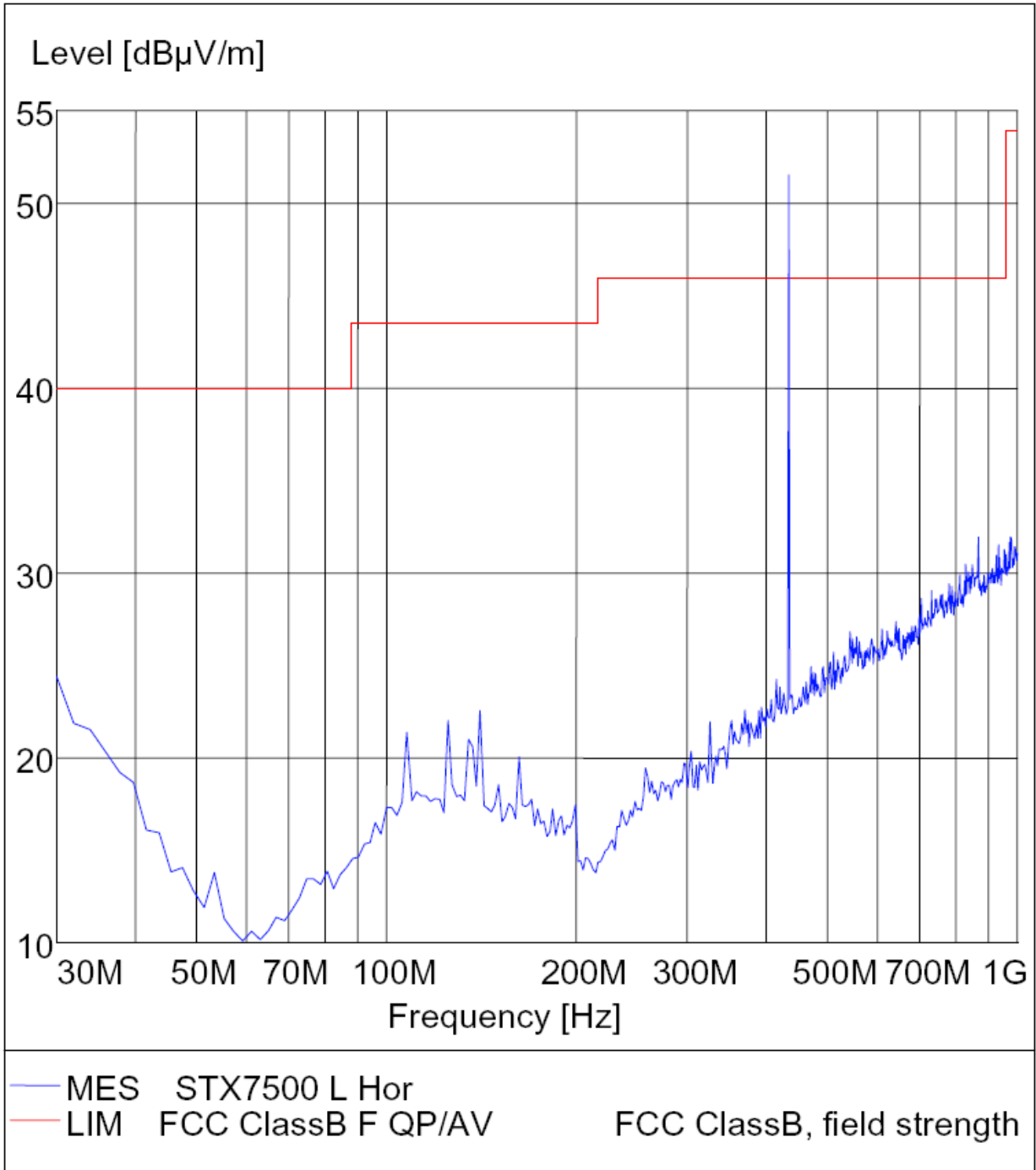


APPENDIX I (Test Curves)

Radiated Disturbance

FCC Part 15

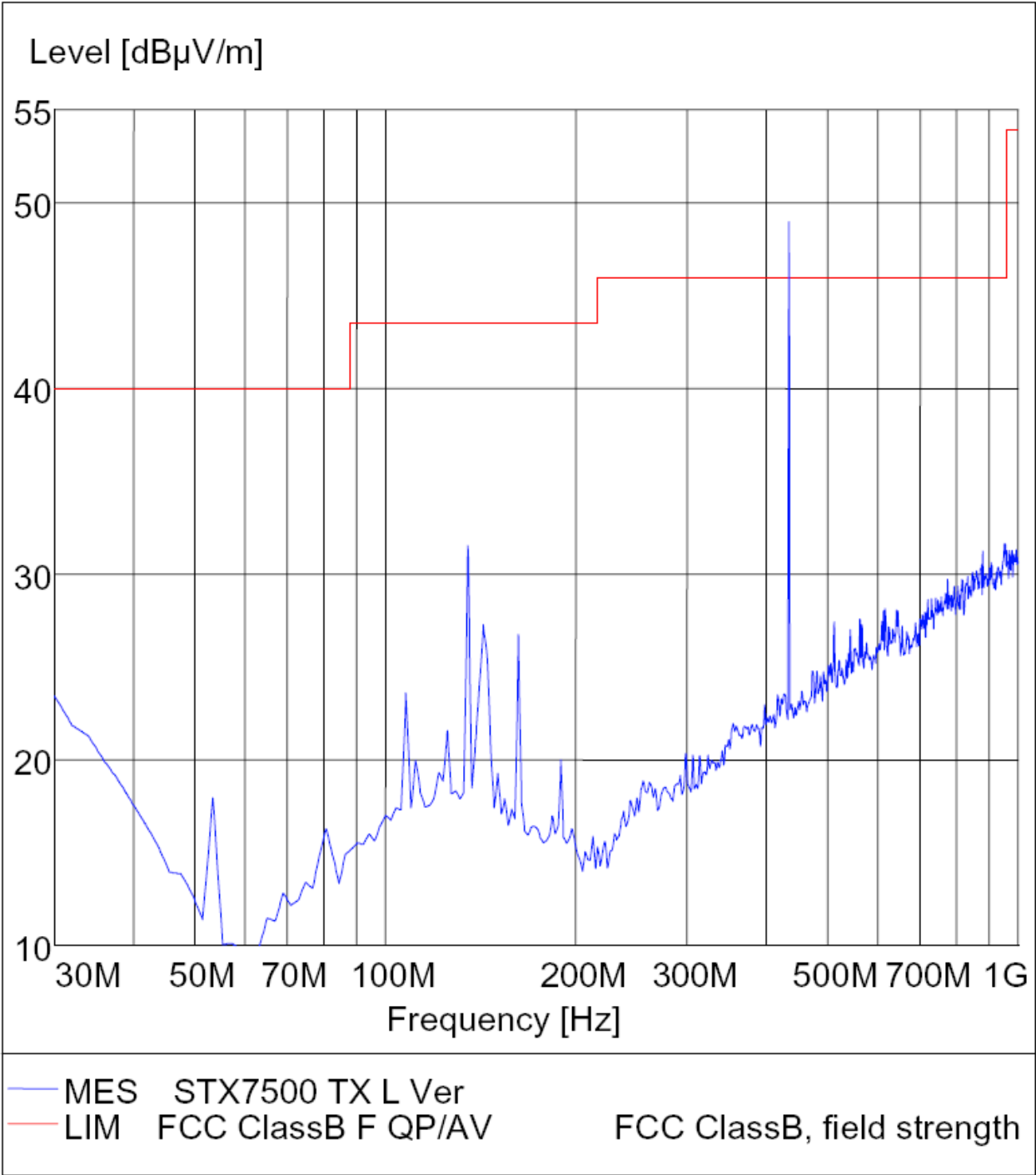
EUT: Outdoor Sensor M/N: STX7500
Manufacturer: Carrin Electronics Co., Ltd.
Operating Condition: TX
Test Site: ATC EMC Lab.SAC
Operator: Andy
Test Specification: Horizontal
Comment : DC 3.0V



Radiated Disturbance

FCC Part 15

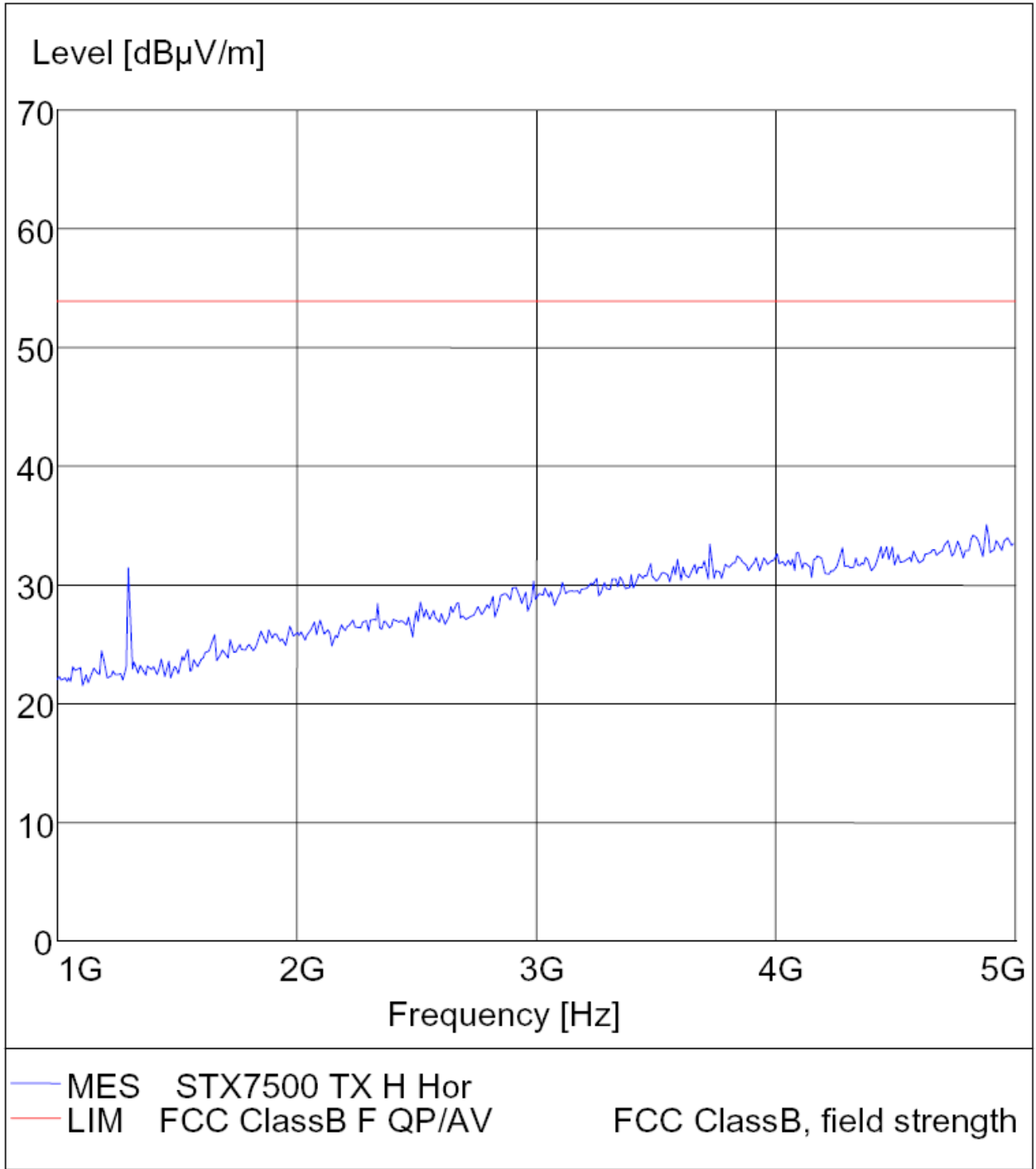
EUT: Outdoor Sensor M/N: STX7500
Manufacturer: Carrin Electronics Co., Ltd.
Operating Condition: TX
Test Site: ATC EMC Lab.SAC
Operator: Andy
Test Specification: Vertical
Comment : DC 3.0V



Radiated Disturbance

FCC Part 15

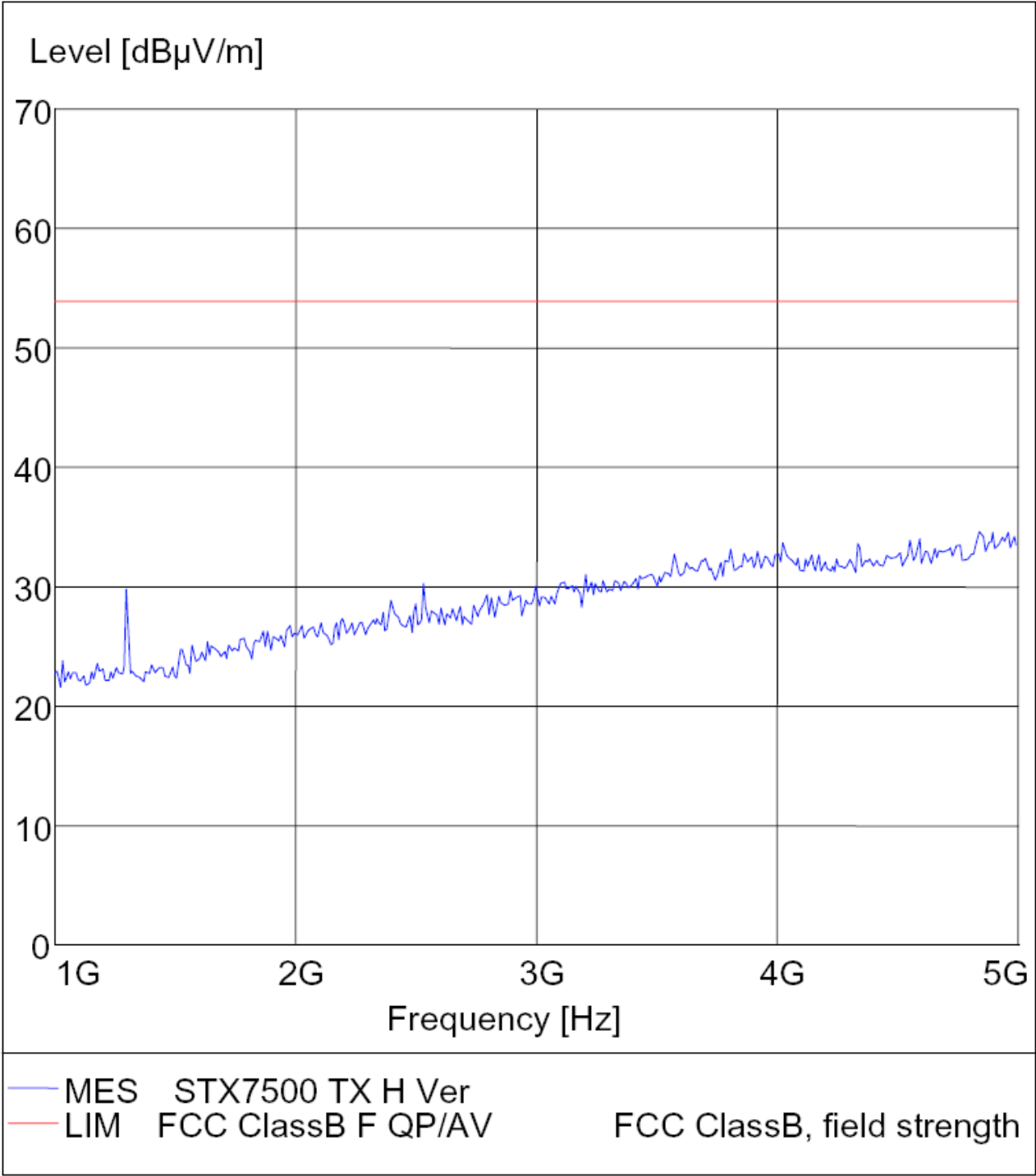
EUT: Outdoor Sensor M/N: STX7500
Manufacturer: Carrin Electronics Co., Ltd.
Operating Condition: TX
Test Site: ATC EMC Lab.SAC
Operator: Andy
Test Specification: Horizontal
Comment : DC 3.0V



Radiated Disturbance

FCC Part 15

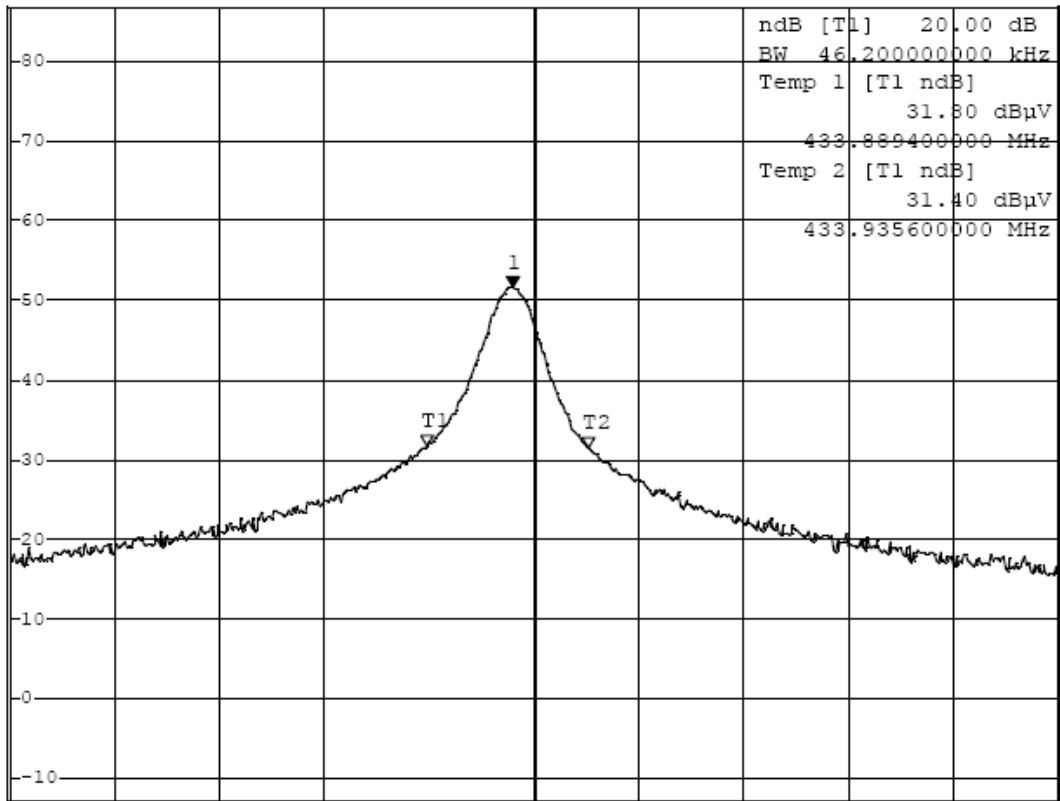
EUT: Outdoor Sensor M/N: STX7500
Manufacturer: Carrin Electronics Co., Ltd.
Operating Condition: TX
Test Site: ATC EMC Lab.SAC
Operator: Andy
Test Specification: Vertical
Comment : DC 3.0V



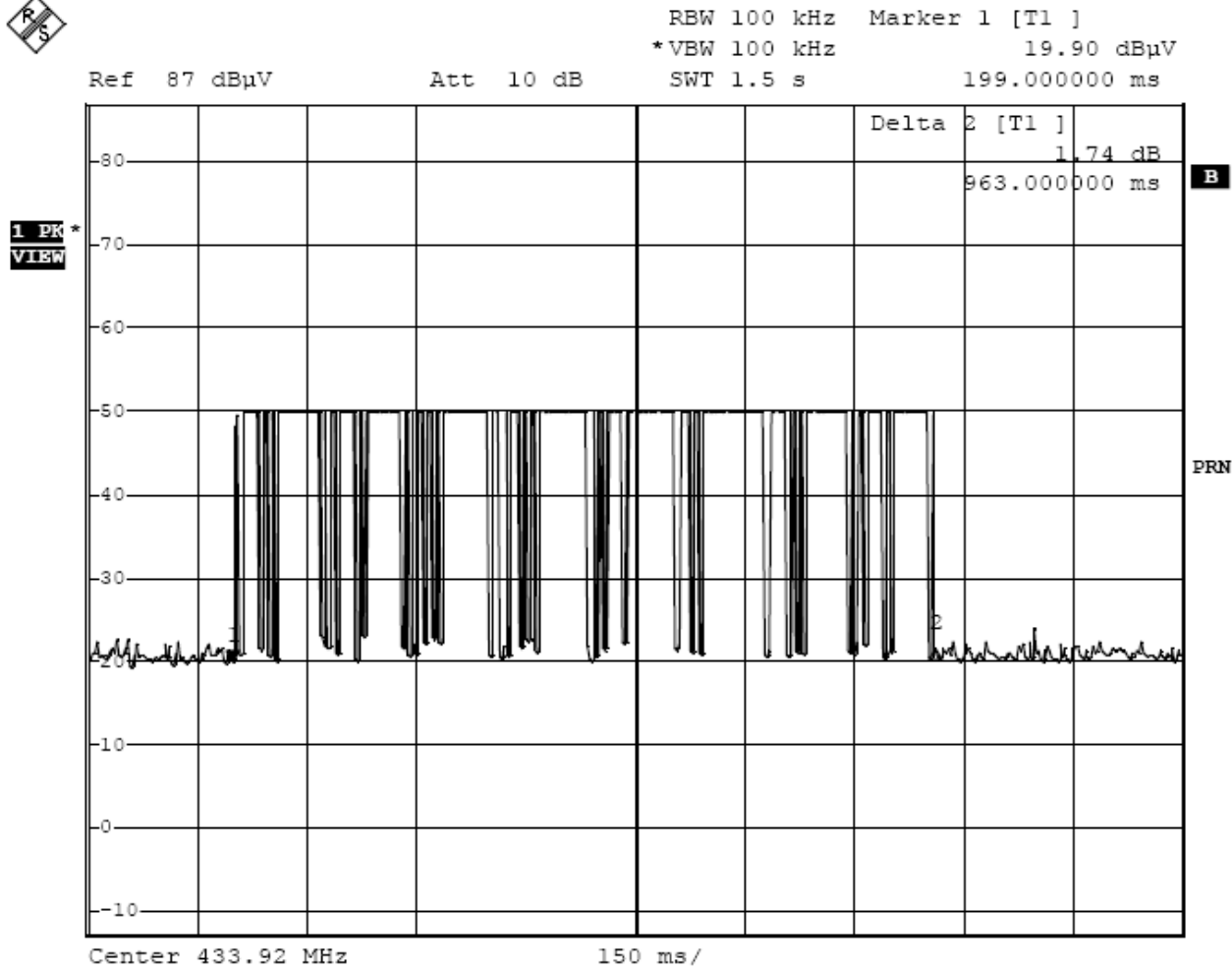


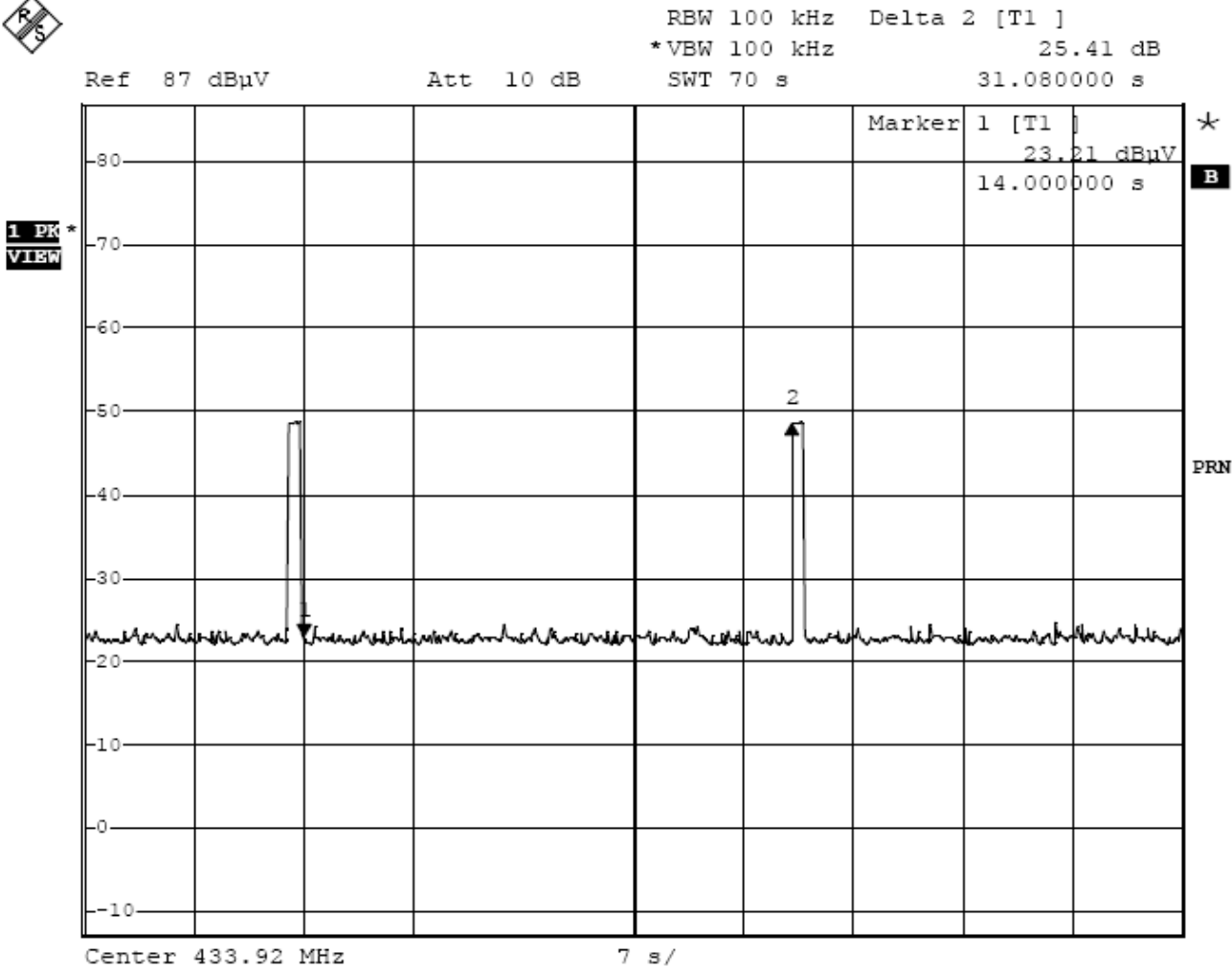
Ref 87 dBuV Att 10 dB *RBW 10 kHz Marker 1 [T1]
*VBW 10 kHz 51.71 dBuV
*SWT 50 ms 433.914000000 MHz

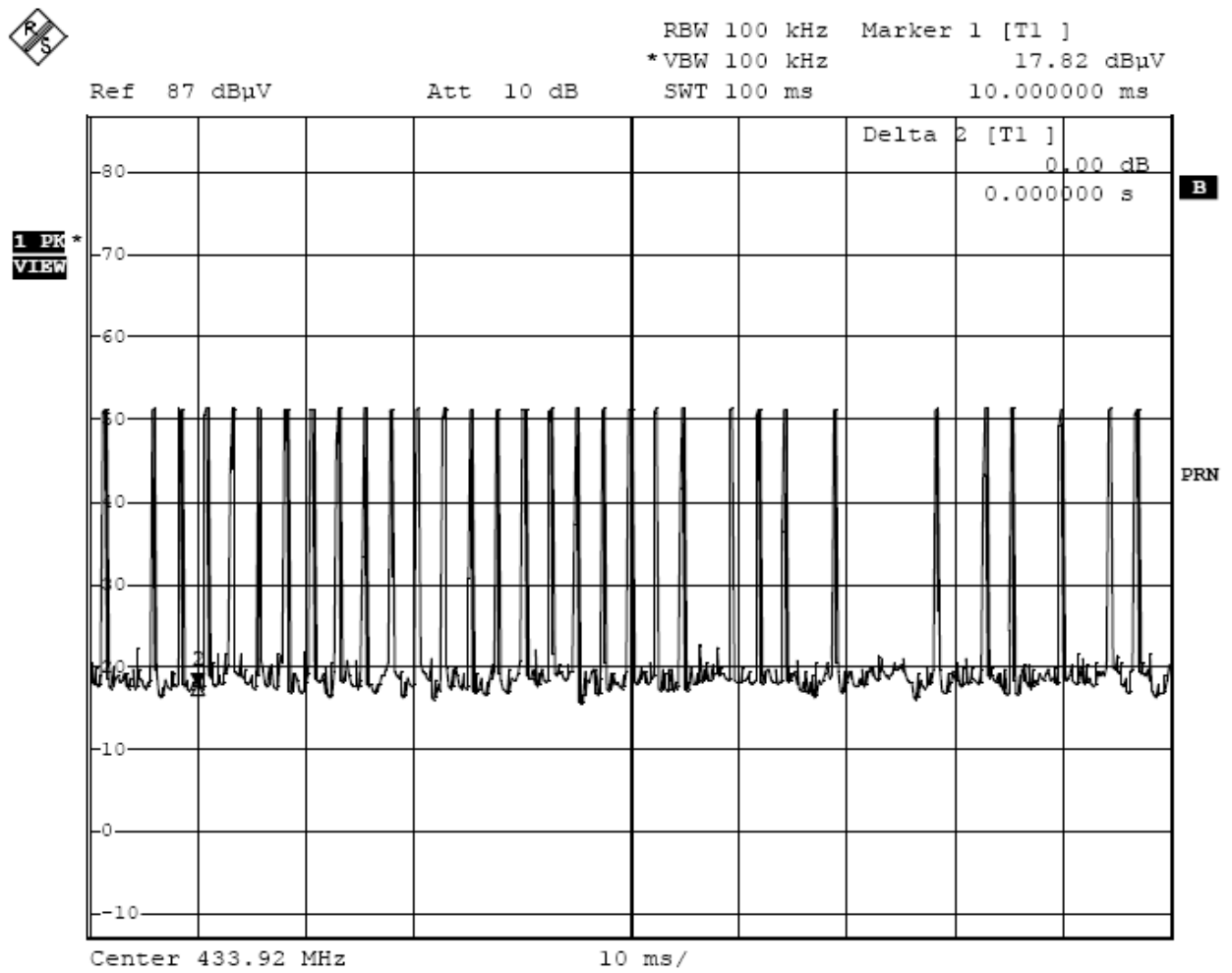
1 PK
VIEW



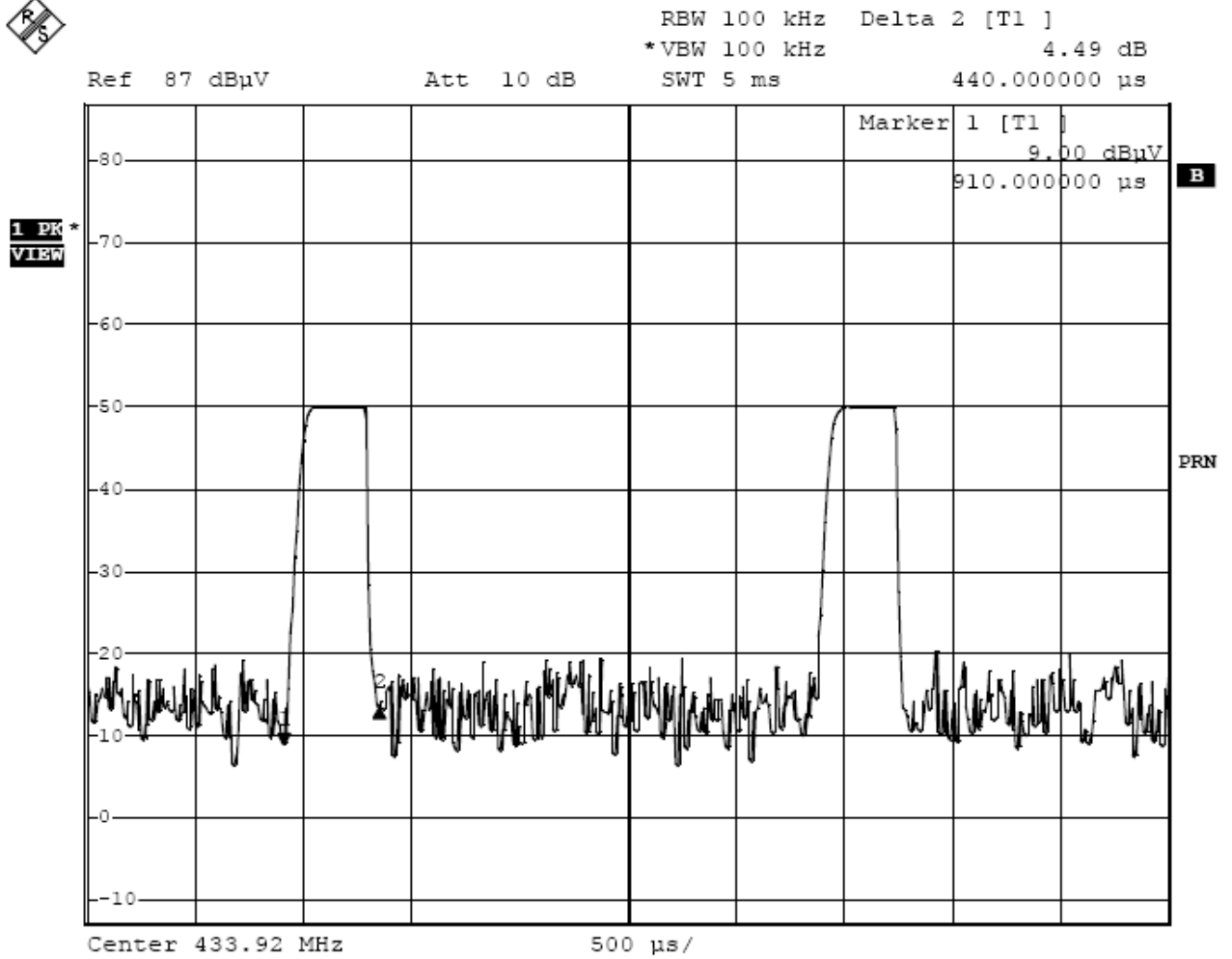
Center 433.92 MHz 30 kHz/ Span 300 kHz







It sums of 32 'on' signals at 100ms.



The graph show the duration of 'on' signal. From marker 1 to marker 2, duration is 0.44ms.