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# RADIO TEST REPORT

For

Shenzhen Petwant Pet Products Co.,Ltd.

Product Name:	Remote Dog Training Collar
Model :	PT-302
Series Model:	N/A
FCC ID:	2AJGV-PT-302
Prepared By :	Shenzhen BST Technology Co., Ltd. Building No.23-24, Zhiheng Industrial Park, Guankouer Road, Nantou,Nanshan District,Shenzhen,Guangdong,China
Test Date:	June 10-30, 2017
Date of Report :	June 30, 2017
Test Result	pass
Report No.:	BST1706794950003Y-ER-2



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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: Shenzhen Petwant Pet Products Co.,Ltd.

Address of applicant: 2/F, No. 64 Wugang Road, Xikeng Community, Henggang Street, Longgang District, Shenzhen

Manufacturer: Shenzhen Petwant Pet Products Co.,Ltd.

Address of manufacturer: 2/F, No. 64 Wugang Road, Xikeng Community, Henggang Street, Longgang District, Shenzhen

General Description of EUT	
Product Name:	Remote Dog Training Collar
Trade Name:	N/A
Model No.:	PT-302
Adding Model(s):	N/A
Rated Voltage:	DC 3.7V
Power Adapter Model:	

Technical Characteristics of EUT	
Frequency Range:	433.92 MHz
Max. Field Strength:	96.2dBuV/m(@1m,peak,horizontal)
Data Rate:	N/A
Modulation:	OOK
Antenna Type:	Built-in antenna
Antenna Gain:	1DBI



## 1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Petwant Pet Products Co.,Ltd. in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

## 1.4 Test Facility

Shenzhen Asia Test Technology Co.,Ltd.

7 / F, Xinwei Building, Gushu Village, Xixiang Town, Baoan District, Shenzhen, China

FCC Registration No.: 348715; IC Registration No.: 12198A

## 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:



## 1.5 EUT Setup and Test Mode

The EUT was operated at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Transmitting	With modulation
TM2		
TM3		

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

## 1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Transmission Time	Conducted	$\pm 5\%$
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$



### 1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-04	2018-06-03
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-04	2018-06-03
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-04	2018-06-03
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-04	2018-06-03
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-04	2018-06-03
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-04	2018-06-03
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-04	2018-06-03
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-04	2018-06-03
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-04	2018-06-03
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-04	2018-06-03
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2017-06-04	2018-06-03
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-04	2018-06-03



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## 2. SUMMARY OF TEST RESULTS

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FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.209	Radiated Spurious Emissions	Compliant
§15.231(a)	Deactivation Testing	Compliant
§15.231(b)	Radiated Emissions	Compliant
§15.231(c)	20dB Bandwidth Testing	Compliant



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### **3. Antenna Requirement**

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#### **3.1 Standard Applicable**

According to FCC Part 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.

#### **3.2 Test Result**

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





## 4. Conducted Emissions

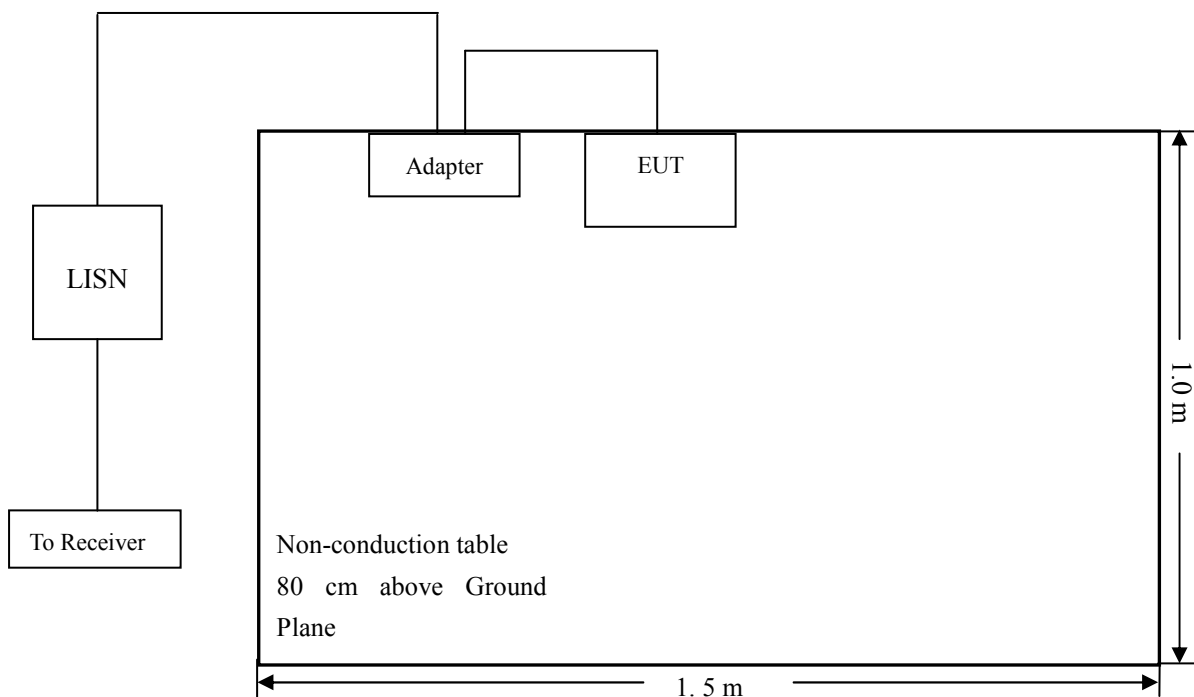
### 4.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

### 4.2 Basic Test Setup Block Diagram



### 4.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

### 4.4 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency ..... 150 kHz  
Stop Frequency..... 30 MHz  
Sweep Speed ..... Auto



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IF Bandwidth.....	10 kHz
Quasi-Peak Adapter Bandwidth .....	9 kHz
Quasi-Peak Adapter Mode .....	Normal

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#### 4.5 Summary of Test Results/Plots

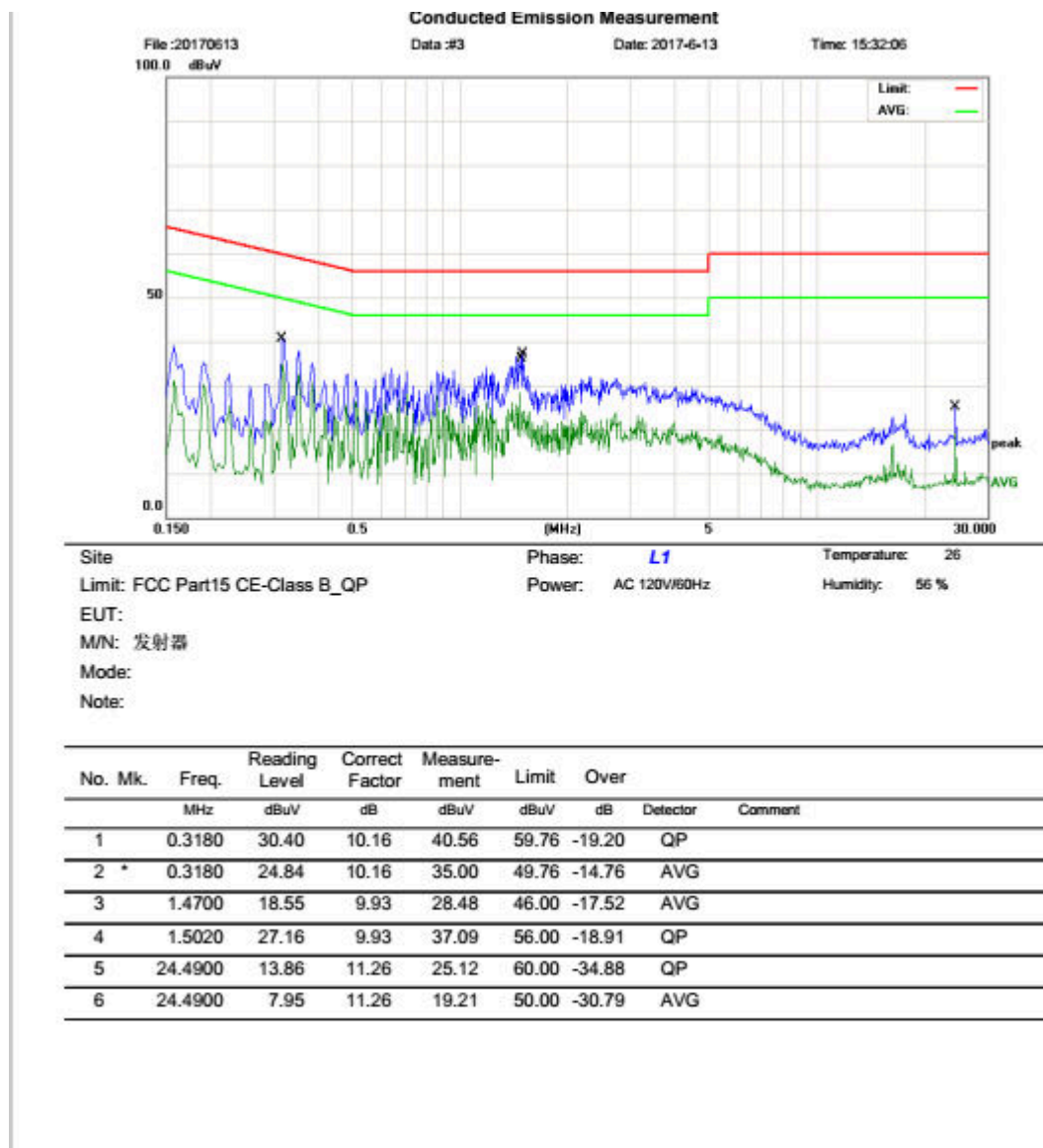
According to the data in section 4.7, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

**-12.74 dB at 1.462 MHz** in the **Neutral** mode, **Average** detector, 0.15-30MHz

#### 4.6 Conducted Emissions Test Data

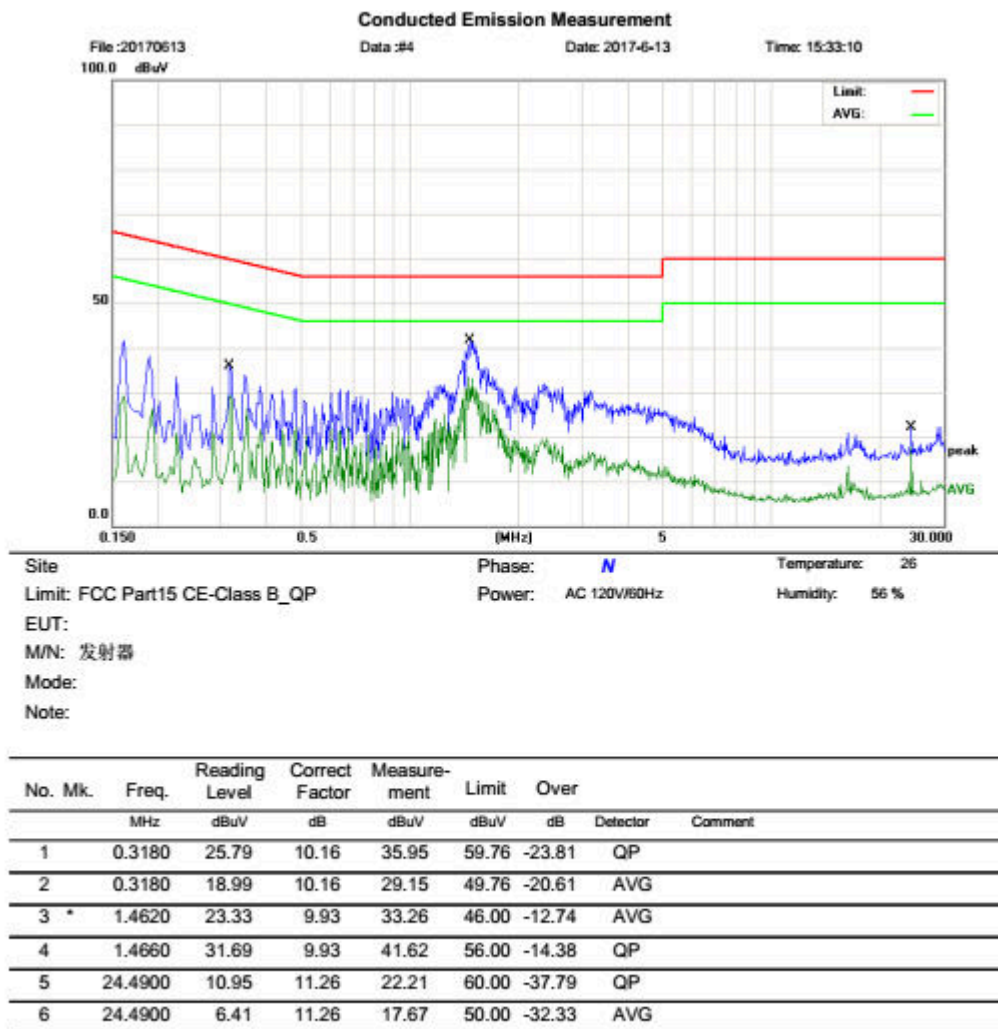
**Plot of Conducted Emissions Test Data**

Test Specification: Line





Test Specification: Neutral





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## 5. Radiated Emissions

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### 5.1 Standard Applicable

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

\*\* linear interpolations

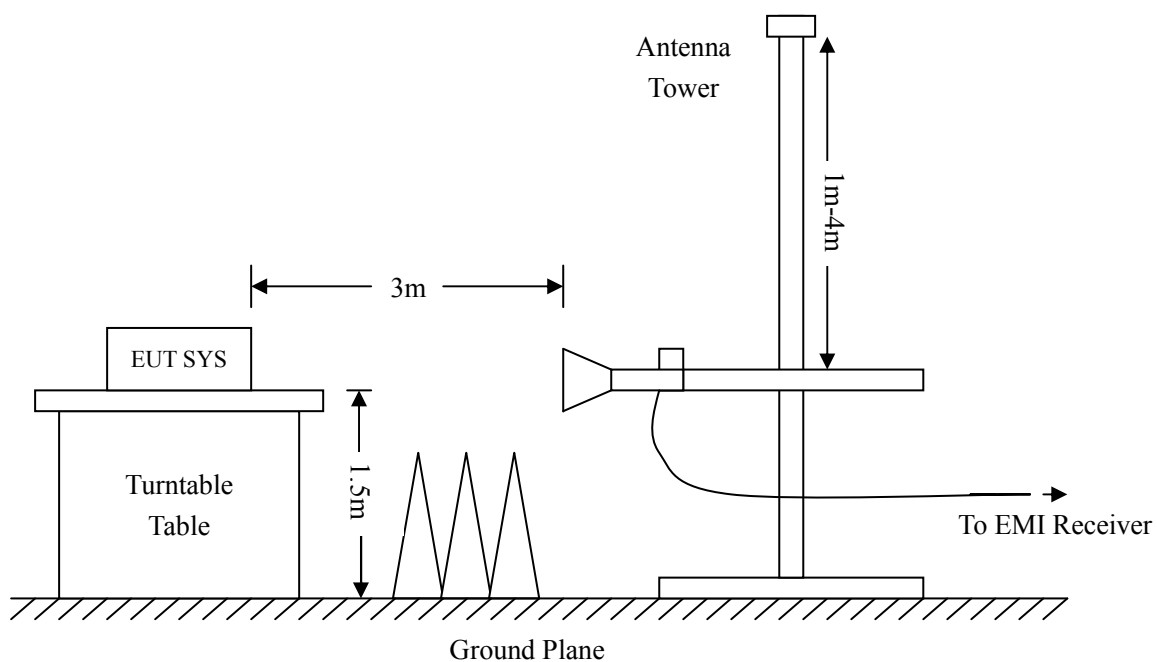
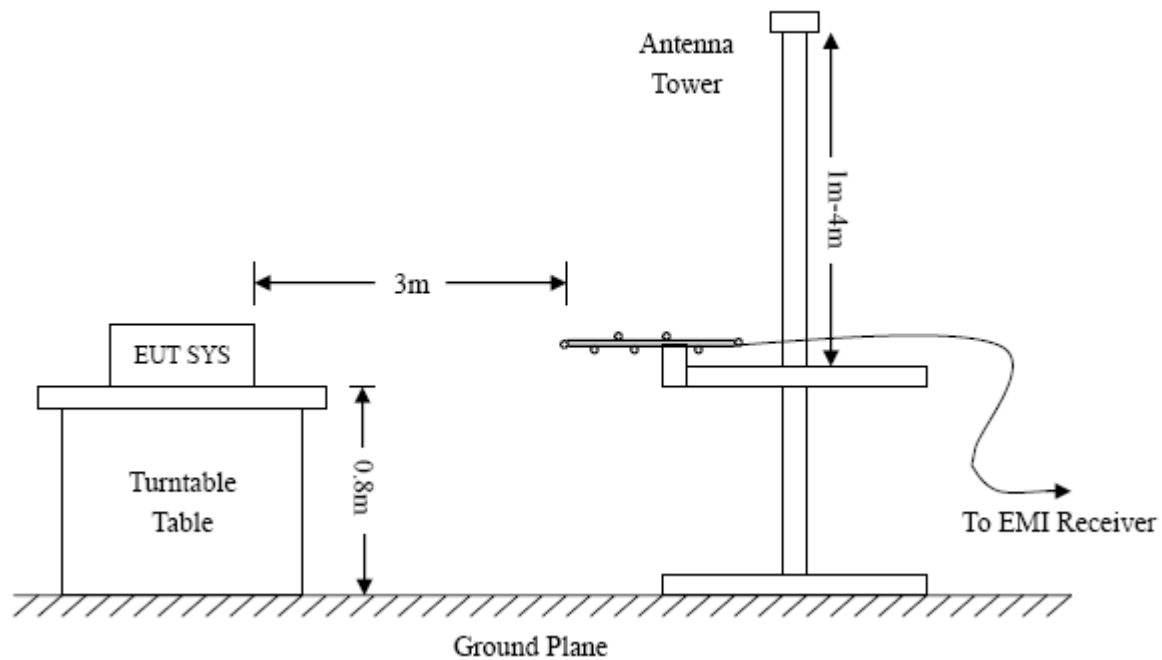
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

## 5.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.





### 5.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Loss} + \text{Cab. Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB $\mu$ V means the emission is 6dB $\mu$ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

### 5.4 Environmental Conditions

Temperature:	21° C
Relative Humidity:	50%
ATM Pressure:	1011 mbar

### 5.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.231 standards, and had the worst margin of:

**-4.40dB at 433.92 MHz in the Vertical polarization, AV Detector, 9 kHz to 5 GHz, 1 Meters**

*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

*Horizontal*

Below 1GHz									
Frequency	Reading	Corr.	Duty cycle	Result	Limit	Margin	Deg.	Height	Remark
MHz	dBuV/m	Factor(dB)	Factor(dB)	dBuV/m	dBuV/m	(dB)	( ° )	(cm)	
433.9200	76.32	-2.19	/	74.13	80.83	-6.70	203	100	Ave
433.9200	/	/	-6.85	80.98	100.83	-19.85	203	100	peak
867.8400	35.16	4.63	/	39.79	60.83	-21.04	98	100	Ave
867.8400	/	/	-6.85	46.64	80.83	-34.19	98	100	peak
Above 1GHz									
1301.760	44.59	-12.91	/	31.68	54.00	-22.32	125	150	Ave
1301.760	/	/	-6.85	42.79	74.00	-31.21	125	150	Peak
1735.680	44.25	-9.20	/	35.05	54.00	-18.95	56	150	Ave
1735.680	/	/	-6.85	41.90	74.00	-32.10	56	150	Peak

*Vertical*

Below 1GHz									
Frequency	Reading	Corr.	Duty cycle	Result	Limit	Margin	Deg.	Height	Remark
MHz	dBuV/m	Factor(dB)	Factor(dB)	dBuV/m	dBuV/m	(dB)	( ° )	(cm)	
433.9200	78.62	-2.19	/	76.43	80.83	-4.40	226	100	Ave
433.9200	/	/	-6.85	83.28	100.83	-17.55	226	100	peak
867.8400	37.46	4.63	/	42.09	60.83	-18.74	102	100	Ave
867.8400	/	/	-6.85	48.94	80.83	-31.89	102	100	peak
Above 1GHz									
1301.760	46.89	-12.91	/	33.98	54.00	-20.02	136	150	Ave
1301.760	/	/	-6.85	40.83	74.00	-33.17	136	150	Peak
1735.680	46.55	-9.20	/	37.35	54.00	-16.65	50	150	Ave
1735.680	/	/	-6.85	44.2	74.00	-29.8	50	150	Peak

*Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5<sup>th</sup> Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

*The measurements greater than 20dB below the limit from 9kHz to 30MHz..*

*The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 433.92MHz.*

*Peak values (= Average value + |Duty Cycle Factor|)*





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## 6. 20dB Bandwidth

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### 6.1 Standard Applicable

According to FCC Part 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### 6.1 Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

### 6.2 Environmental Conditions

Temperature:	21° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

### 6.3 Summary of Test Results/Plots

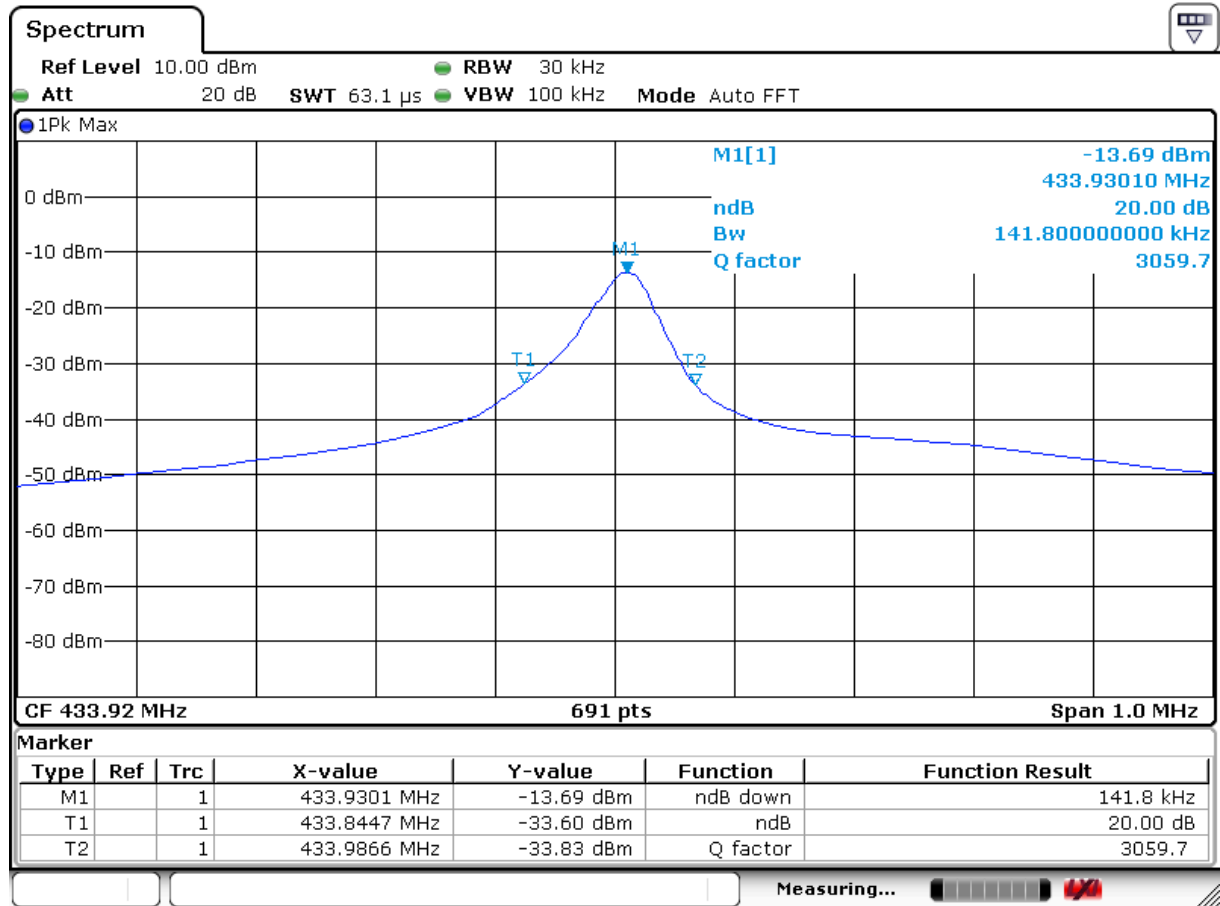
Test Frequency MHz	20dB Bandwidth kHz	Limit kHz	Result
433.92	141.8	1084	Pass

Limit = Fundamental Frequency X 0.25% = 433.92 MHz X 0.25% = 1084 kHz

*Please refer to the attached plots.*



## 20dB Bandwidth Test Plot



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## 7. Transmission Time

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### 7.1 Standard Applicable

According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:

- 1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

### 7.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

### 7.3 Environmental Conditions

Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

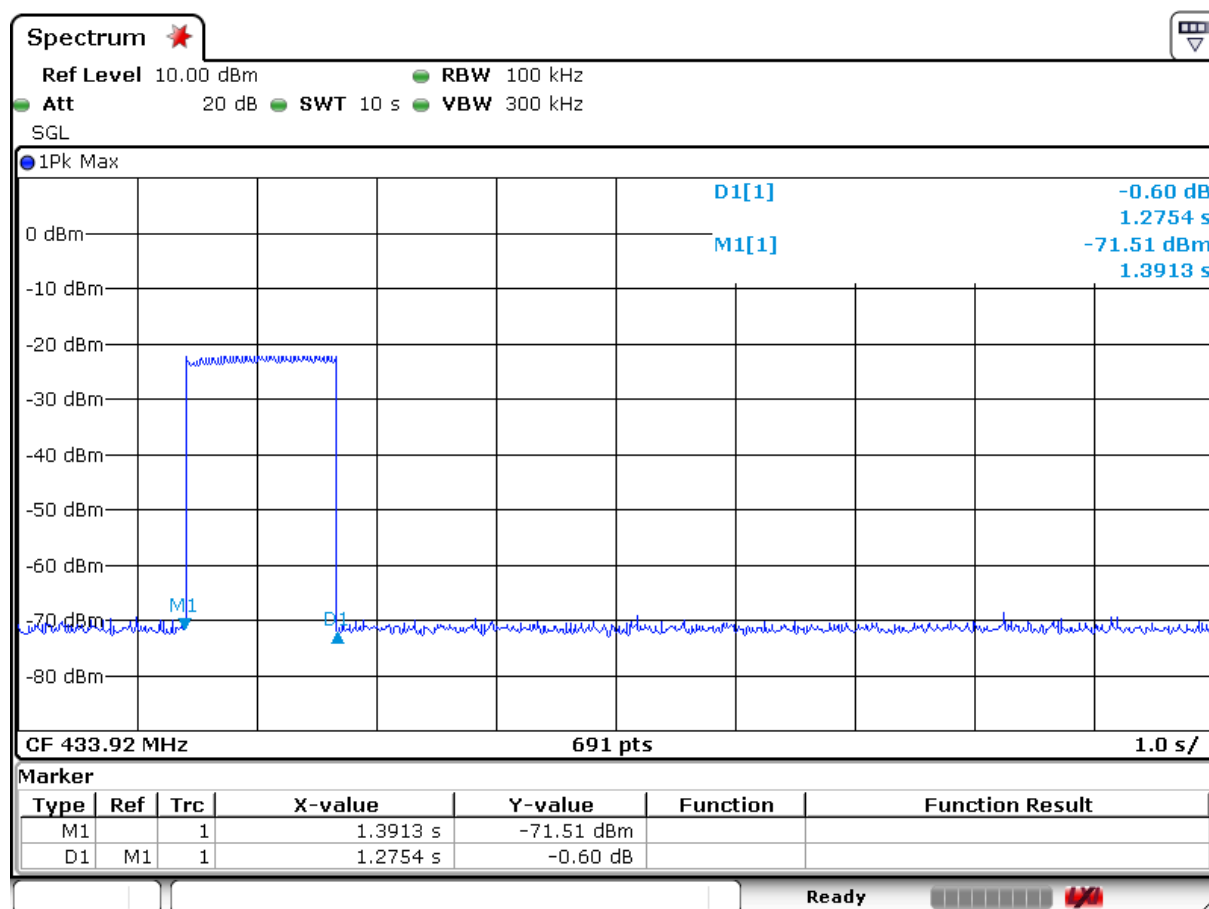
### 7.4 Summary of Test Results/Plots

Transmission Type	Test Frequency MHz	Transmission Time seconds	Limit s	Result
Manually	433.92	1.28	5	Pass

*Please refer to the attached plots.*



## Transmission Time



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## 8. Duty Cycle

### 8.1 Standard Applicable

According to FCC Part 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

### 8.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

### 8.3 Environmental Conditions

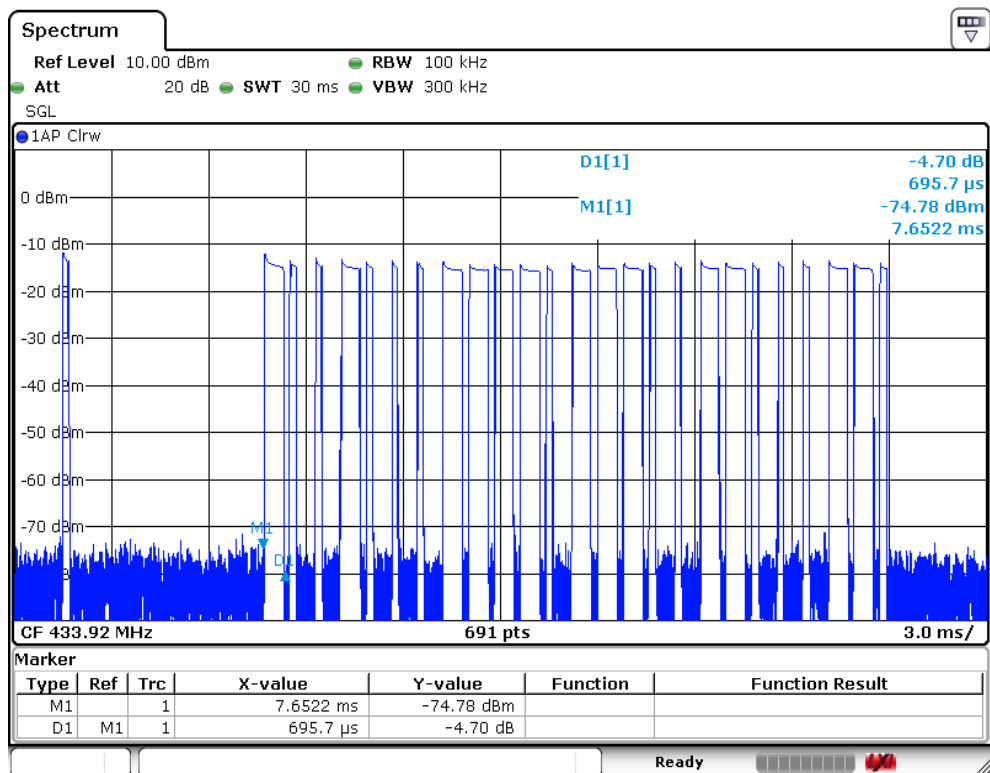
Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

### 8.4 Summary of Test Results

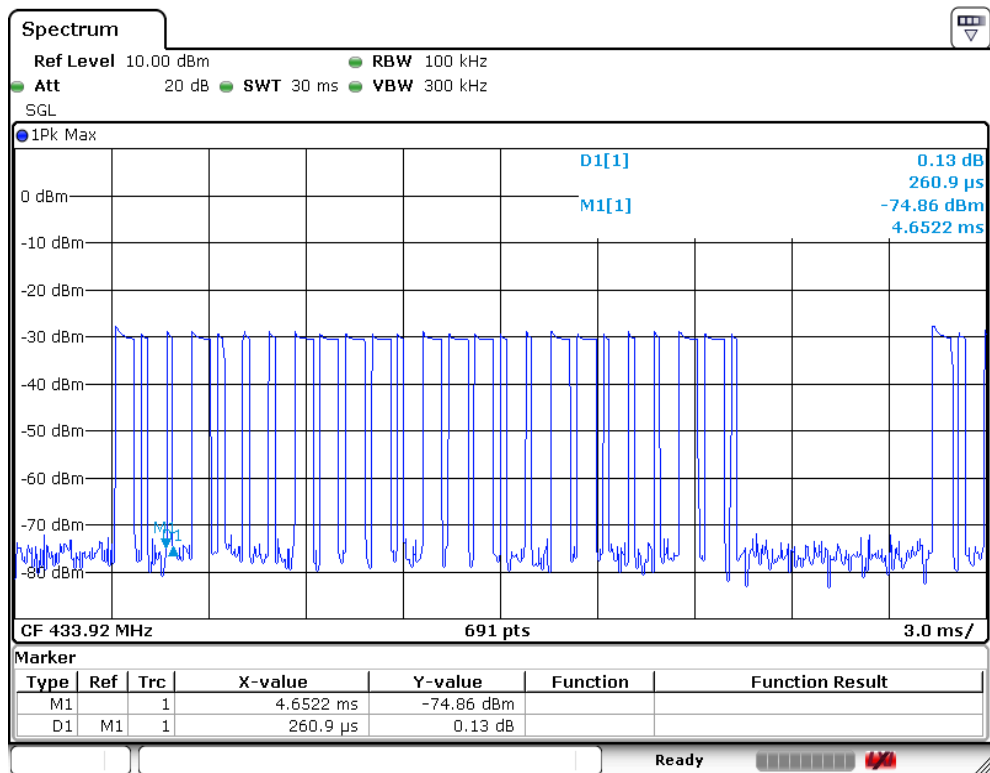
Type of Pulse	Width of Pulse ms	Quantity of Pulse	Transmission Time ms	Total Time (T <sub>on</sub> ) ms
Pulse 1 (Wide)	0.6957	13	9.0441	11.914
Pulse 2 (Narrow)	0.2609	11	2.8699	

Test Period (T <sub>p</sub> ) ms	Total Time (T <sub>on</sub> ) ms	Duty Cycle %	Duty Cycle Factor dB
1000	26.217	45.44	-6.85

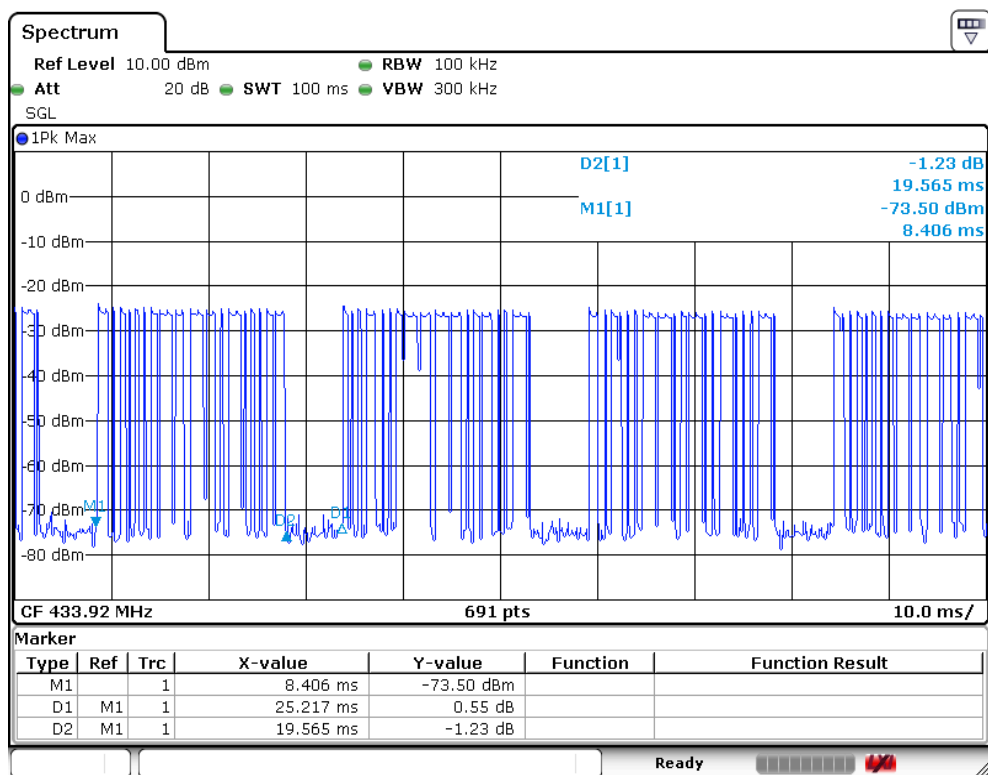
*Please refer to the attached test plots*



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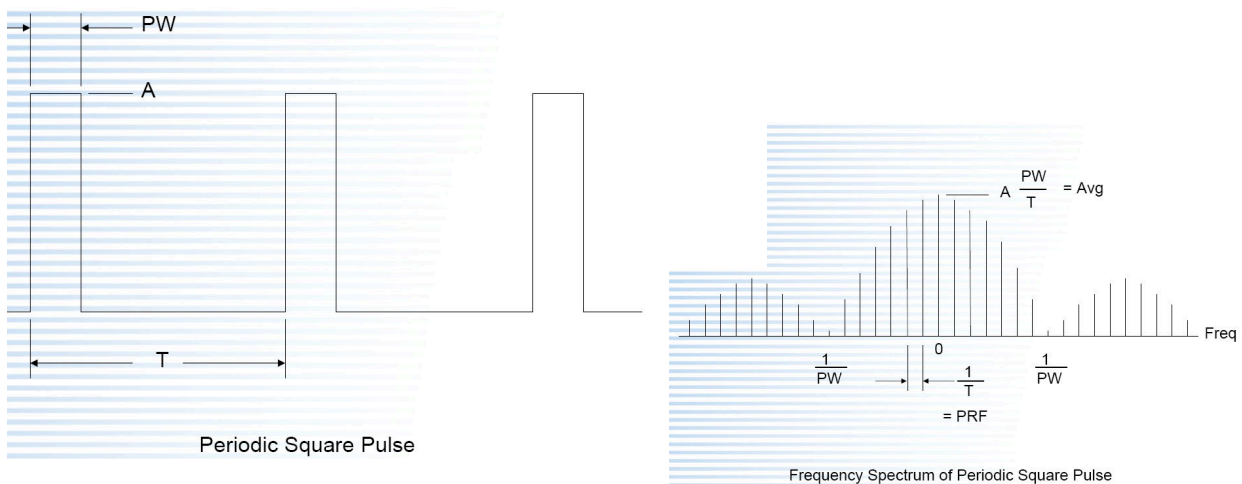
Date: 27 JUN 2017 19:38:58



## 9. Pulse Desensitization Correction Factor

(§15.35 Measurement detector functions and bandwidths.)

a. Part 15 of the FCC Rules provides for the operation of low power communication devices without an individual license (e.g., intrusion detectors, pulsed water tank level gauges, etc.), subject to certain requirements. Some of these devices use extremely narrow pulses to generate wideband emissions, which are measured to determine compliance with the rules. These measurements are typically performed with a receiver or spectrum analyzer. Depending on a number of factors (e.g., resolution bandwidth, pulsewidth, etc.), the spectrum analyzer may not always display the true peak value of the measured emission. This effect, called “pulse desensitization,” relates to the capabilities of the measuring instrument. For the measurement and reporting of the true peak of pulsed emissions, it may be necessary to apply a “pulse desensitization correction factor” (PDCF) to the measured value, pursuant to 47 CFR 15.35(a).



If using spectrum analyzer to measure pulse signal, it has to make sure the RBW use is at least  $2/PW$ .

- When RBW is less than  $2/PW$ , you are able to measure the true peak level of the pulse signal. If this is the case, PDCF is required to compensate to determine true peak value.

Pulse desensitization:

$PW = 11914 \mu\text{sec} (0.36957 \times 10 + 0.2609 \times 11)$ , Period = 45000  $\mu\text{sec}$ , Level = A

$RBW > 2/PW = 0.168 \text{K}$ ,  $1/T = 0.02 \text{K}$

NOTE:  $2/PW < RBW$ , first don't need

b. For the actual test, please refer to the ANSI C63.10, Annex C refer to section 5 for more detail





## 10 Test Photo

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\*\*\*\*\* END OF REPORT \*\*\*\*\*