



# FCC Part 15C Test Report

## FCC ID:RWE-4NPHLN

Product Name:	Wifi Security Camera Video Doorbell
Trademark:	N/A
Model Name :	4NPHLN0000010 NPHLN, WD-608, WD-609, WD-610, WD-612, WD-616, WD-618, WD-619, WD-620, WD-621, WD-622
Prepared For :	Shenzhen Forrinx Electronics Co., Ltd.
Address :	Building 9, No.18, North Area of Makan Industrial Park, Xili Town, Nanshan District, Shenzhen, China
Prepared By :	Shenzhen BCTC Testing Co., Ltd.
Address :	BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China
Test Date:	Jun. 25, 2019 – Jul. 08, 2019
Date of Report :	Jul. 08, 2019
Report No.:	BCTC-FY190603174-1E



### VERIFICATION OF COMPLIANCE

**Applicant's name** ..... Shenzhen Forrinx Electronics Co., Ltd.  
Address ..... Building 9, No.18, North Area of Makan Industrial Park, Xili Town, Nanshan District, Shenzhen, China

**Manufacture's Name**... Shenzhen Forrinx Electronics Co., Ltd.  
Address ..... Building 9, No.18, North Area of Makan Industrial Park, Xili Town, Nanshan District, Shenzhen, China

**Product description**

Product name..... Wifi Security Camera Video Doorbell  
Trademark: N/A  
4NPHLN0000010  
Model Name: NPHLN, WD-608, WD-609, WD-610, WD-612, WD-616, WD-618, WD-619, WD-620, WD-621, WD-622  
FCC Part15.231  
Test Standards: ANSIC63.10-2013

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Result..... **Pass**

Prepared by(Engineer): Leke Xie  
Reviewer(Supervisor): Eric Yang  
Approved(Manager): Zero Zhou

*Leke Xie*  
*Eric Yang*  
*Zero Zhou*  




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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.231) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.209,15.231b	Fundamental &Radiated Spurious Emission Measurement	PASS	
15.231c	Occupy Bandwidth	PASS	
15.231a	Dwell time	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report



## 1.1 TEST FACILITY

Shenzhen BCTC Testing Co., Ltd.

Add.: BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 712850

IC Registered No.: 23583

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
3	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
4	Conducted Adjacent channel power	U=1.38dB
5	Conducted output power uncertainty Above 1G	U=1.576dB
6	Conducted output power uncertainty below 1G	U=1.28dB
7	humidity uncertainty	U=5.3%
8	Temperature uncertainty	U=0.59°C



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Wifi Security Camera Video Doorbell	
Trade Name	N/A	
Model Name	4NPHLN0000010	
Serial Model	NPHLN, WD-608, WD-609, WD-610, WD-612, WD-616, WD-618, WD-619, WD-620, WD-621, WD-622	
Model Difference	All the model are the same circuit and RF module, except model names .	
Product Description	Operation Frequency:	433.92MHz
	Modulation Type:	ASK
	Antenna Type:	Spring antenna
	Antenna Gain:	1dBi
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.	
Ratings	DC 5V From adapter, DC 3.7V For battery	
Connecting I/O Port(s)	Please refer to the User's Manual	
hardware version	N/A	
Software version	N/A	
Serial number	N/A	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



## 2.2 DESCRIPTION OF TEST MODES

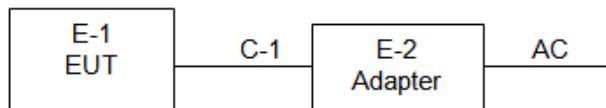
For All Emission	
Final Test Mode	Description
Mode 1	TX Mode

Note:

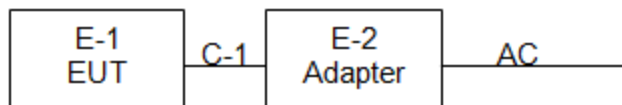
- (1) Fully-charged battery is used during the test

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission Test



Spurious emissions



## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Device Type	Brand	Model	Series No.	Data Cable
E-1	Wifi Security Camera Video Doorbell	N/A	4NPHLN0000010	N/A	EUT
E-2	Adapter	N/A	BCTC005	N/A	Auxiliary





Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1.0M	USB cable unshielded

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.



## 2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

### Radiation Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4407B	MY45109572	2019.06.13	2020.06.12
2	Test Receiver (9kHz-7GHz)	R&S	ESR7	101154	2019.06.13	2020.06.12
3	Bilog Antenna (30MHz-3GHz)	SCHWARZBECK	VULB9163	VULB9163-942	2019.06.22	2020.06.21
4	Horn Antenna (1GHz-18GHz)	SCHWARZBECK	BBHA9120D	1541	2019.06.22	2020.06.21
5	Horn Antenna (18GHz-40GHz)	SCHWARZBECK	BBHA9170	822	2019.06.22	2020.06.21
6	Amplifier (9KHz-6GHz)	SCHWARZBECK	BBV9744	9744-0037	2019.06.25	2020.06.24
7	Amplifier (0.5GHz-18GHz)	SCHWARZBECK	BBV9718	9718-309	2019.06.25	2020.06.24
8	Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	2019.06.17	2020.06.16
9	Loop Antenna (9KHz-30MHz)	SCHWARZBECK	FMZB1519B	014	2019.06.25	2020.06.24
10	RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-0008	2019.06.25	2020.06.24
11	RF cables2 (30MHz-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	2019.06.25	2020.06.24
12	RF cables3 (1GHz-40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	2019.06.25	2020.06.24
13	Power Metter	Keysight	E4419	\	2019.06.17	2020.06.16
14	Power Sensor (AV)	Keysight	E9 300A	\	2019.06.17	2020.06.16
15	Spectrum Analyzer 20kHz-26.5GHz	KEYSIGHT	N9020A	MY49100060	2019.06.13	2020.06.12
16	Spectrum Analyzer 9kHz-40GHz	R&S	FSP40	100363	2019.06.13	2020.06.12
17	D.C. Power Supply	LongWei	TPR-6405D	\	\	\
18	Software	Frad	EZ-EMC	FA-03A2 RE	\	\



Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESR3	102075	2019.06.13	2020.06.12
2	LISN	SCHWARZBEC K	NSLK8127	8127739	2019.06.13	2020.06.12
3	LISN	R&S	ENV216	101375	2019.06.13	2020.06.12
4	RF cables	Huber+Suhnar	9kHz-30MHz	B1702988-00 08	2019.06.25	2020.06.24
5	Software	Frad	EZ-EMC	EMC-CON 3A1	\	\



### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

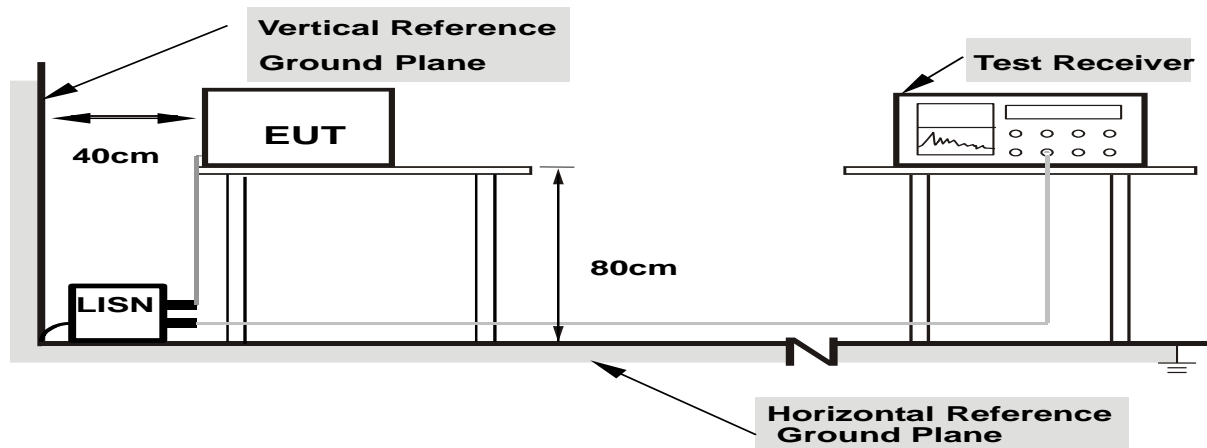
### 3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 TEST SETUP



- Note: 1.Support units were connected to second LISN.**  
**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

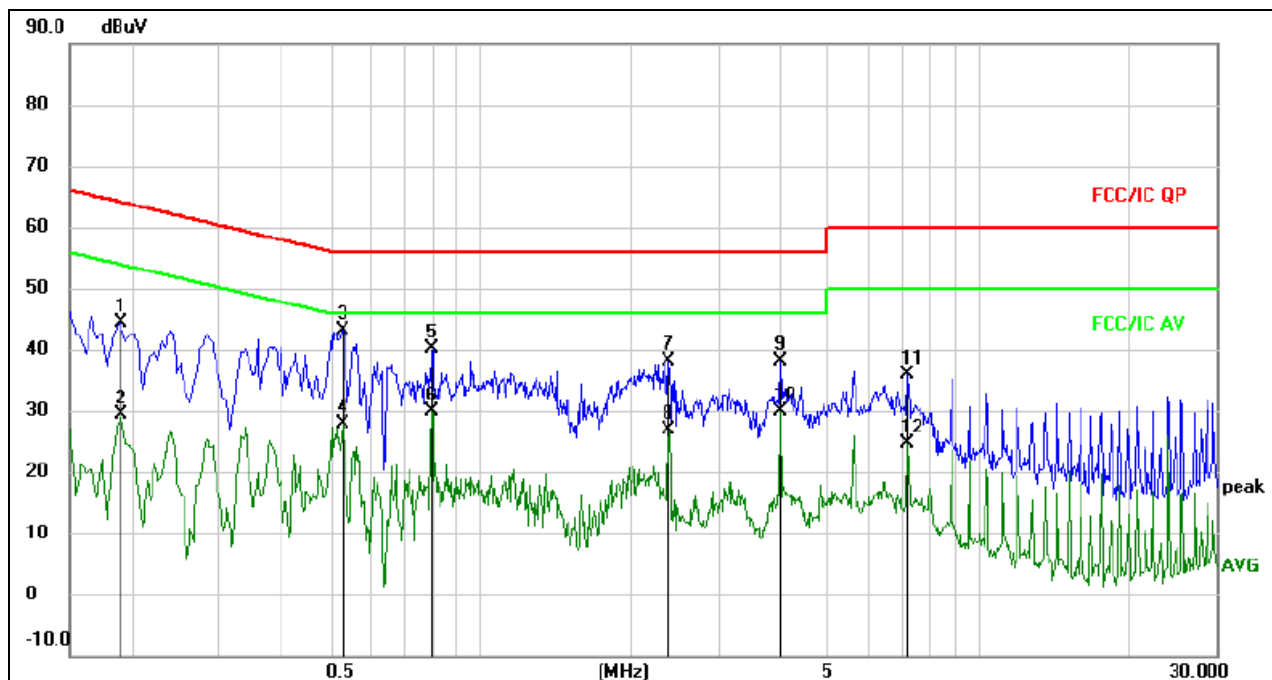
### 3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

### 3.1.6 TEST RESULTS



Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 1



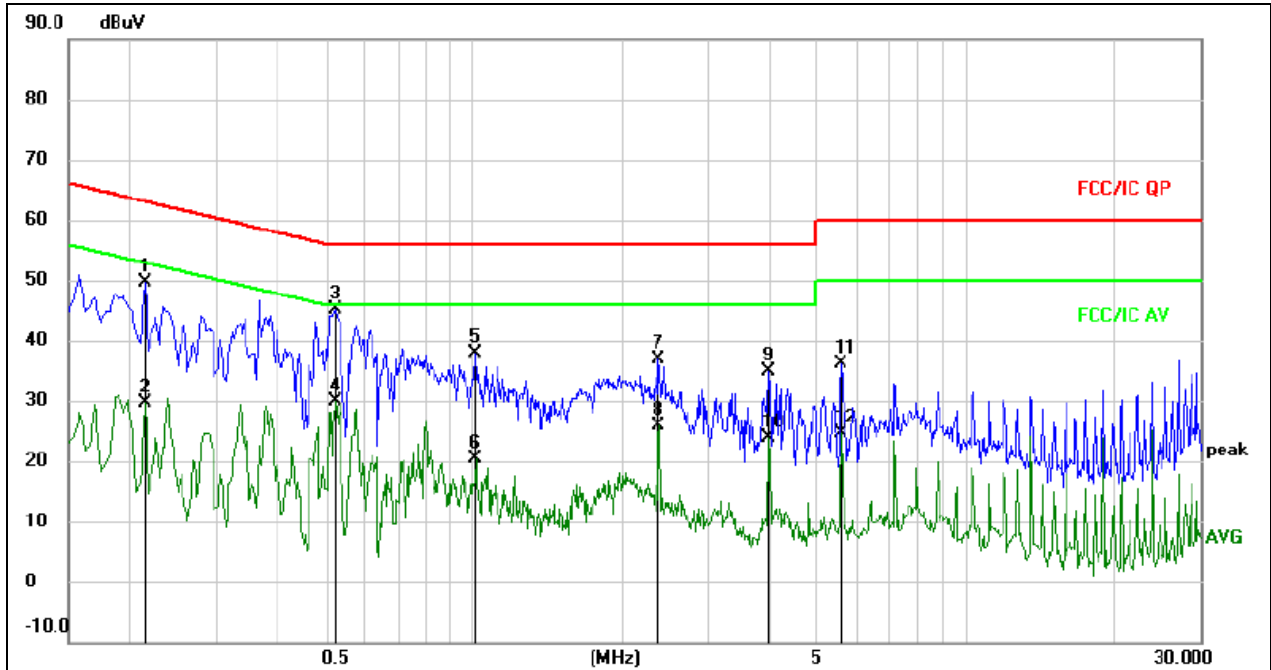
Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1900	34.99	9.47	44.46	64.04	-19.58	QP	
2		0.1900	19.79	9.47	29.26	54.04	-24.78	AVG	
3	*	0.5299	33.49	9.71	43.20	56.00	-12.80	QP	
4		0.5299	18.29	9.71	28.00	46.00	-18.00	AVG	
5		0.7980	30.49	9.63	40.12	56.00	-15.88	QP	
6		0.7980	20.21	9.63	29.84	46.00	-16.16	AVG	
7		2.3940	28.51	9.62	38.13	56.00	-17.87	QP	
8		2.3940	17.28	9.62	26.90	46.00	-19.10	AVG	
9		3.9900	28.31	9.73	38.04	56.00	-17.96	QP	
10		3.9900	20.24	9.73	29.97	46.00	-16.03	AVG	
11		7.1980	26.15	9.72	35.87	60.00	-24.13	QP	
12		7.1980	14.84	9.72	24.56	50.00	-25.44	AVG	



Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 1



Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2140	40.19	9.48	49.67	63.05	-13.38	QP	
2		0.2140	20.08	9.48	29.56	53.05	-23.49	AVG	
3	*	0.5220	35.44	9.68	45.12	56.00	-10.88	QP	
4		0.5220	20.19	9.68	29.87	46.00	-16.13	AVG	
5		1.0060	28.29	9.57	37.86	56.00	-18.14	QP	
6		1.0060	10.75	9.57	20.32	46.00	-25.68	AVG	
7		2.3820	27.20	9.62	36.82	56.00	-19.18	QP	
8		2.3820	16.32	9.62	25.94	46.00	-20.06	AVG	
9		3.9780	25.05	9.73	34.78	56.00	-21.22	QP	
10		3.9780	14.03	9.73	23.76	46.00	-22.24	AVG	
11		5.5780	26.28	9.78	36.06	60.00	-23.94	QP	
12		5.5780	14.92	9.78	24.70	50.00	-25.30	AVG	

3.2 RADIATED EMISSION MEASUREMENT



### 3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.231(b) limit in the table below has to be followed.

Frequencies(MHz)	Field Strength(micorvolts/meter)	Measurement Distance(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

#### FUNDAMENTAL AND HARMONICS EMISSION LIMITS

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

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $56.81818(F) - 6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F) - 7083.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]





**FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)**

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 <sup>th</sup> harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW setting	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

**3.2.2 TEST PROCEDURE**

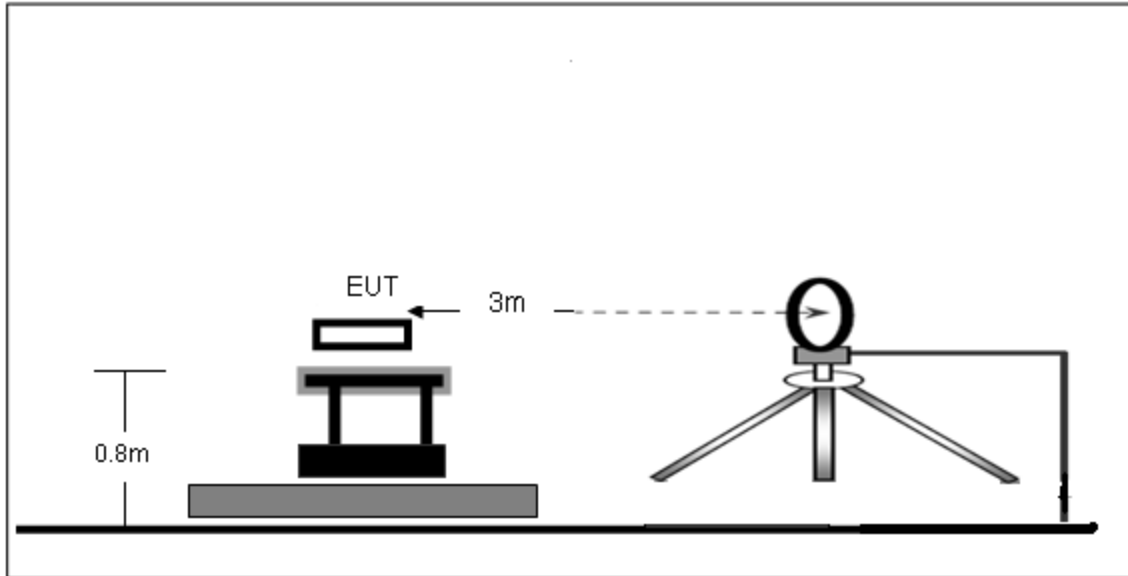
- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; above 1GHz, the height was 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

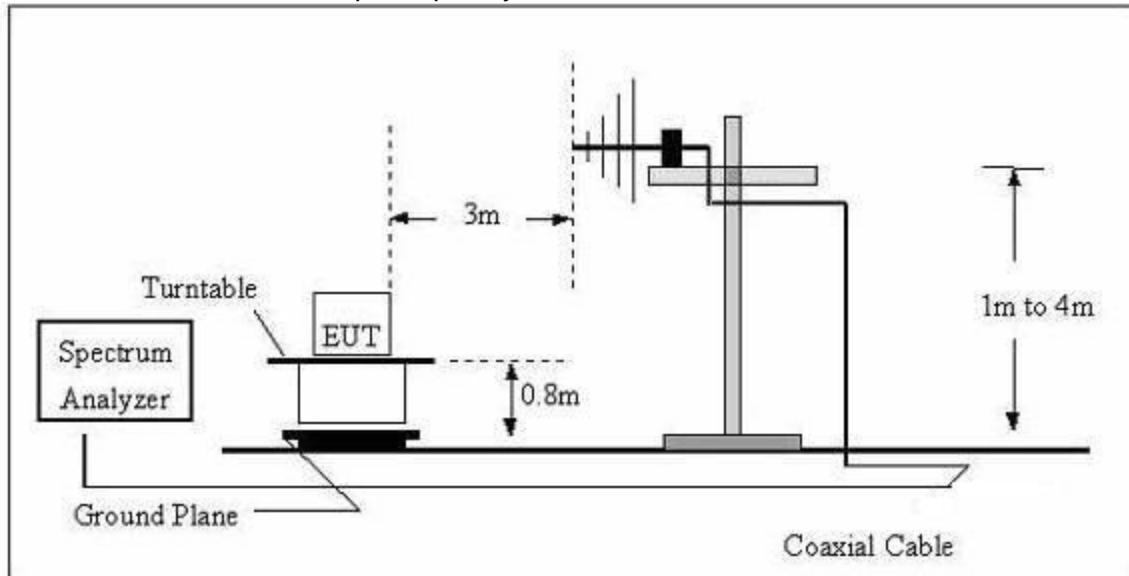
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case was X axis and the emissions were reported

### 3.2.3 TEST SETUP

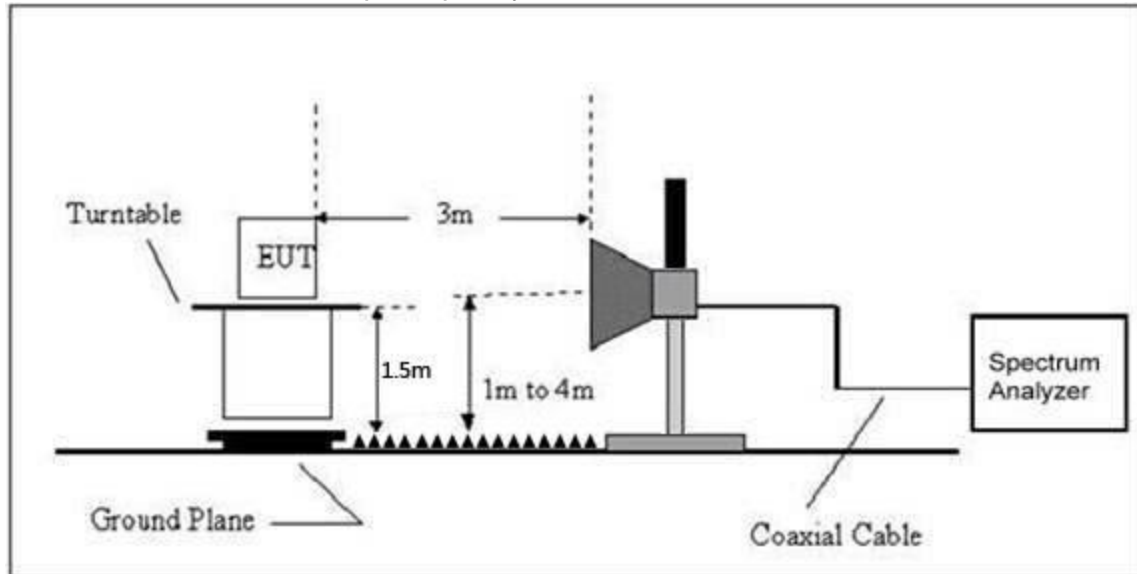
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



### 3.2.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



### 3.2.5 TEST RESULTS

Radiated Spurious Emission (Below 9KHz – 30MHz )

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	---
Test Voltage :	AC120V 60Hz		
Test Mode :	TX Mode		

Freq. (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	State P/F
--	--	--	--	PASS
--	--	--	--	PASS

**NOTE:**

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log(\text{specific distance}/\text{test distance})(\text{dB})$ ;

Limit line = specific limits(dBuv) + distance extrapolation factor.



Radiated Spurious Emission (Between 30MHz – 1GHz)

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Horizontal
Test Voltage :	AC120V 60Hz		
Test Mode :	TX Mode		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
67.9128	46.56	-17.71	28.85	40.00	-11.15	QP
108.6470	49.31	-16.84	32.47	43.50	-11.03	QP
216.7828	41.92	-15.91	26.01	46.00	-19.99	QP
325.5958	36.21	-12.90	23.31	46.00	-22.69	QP
433.9202	90.74	-10.33	80.41	100.80	-20.39	peak
543.2742	36.22	-7.85	28.37	46.00	-17.63	QP
651.9417	36.10	-6.75	29.35	46.00	-16.65	QP
867.8408	65.66	-2.13	63.53	80.80	-17.27	peak

Remark:

Factor = Antenna Factor + Correct Factor.  
Correct Factor= Cable Loss – Pre-amplifier



Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Vertical
Test Voltage :	AC120V 60Hz		
Test Mode :	TX Mode		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
67.9128	33.22	-17.71	15.51	40.00	-24.49	QP
97.7982	40.23	-16.68	23.55	43.50	-19.95	QP
216.7828	35.22	-15.91	19.31	46.00	-26.69	QP
325.5958	34.54	-12.90	21.64	46.00	-24.36	QP
433.9206	92.74	-10.33	82.41	100.80	-18.39	peak
543.2742	36.28	-7.85	28.43	46.00	-17.57	QP
651.9417	36.13	-6.75	29.38	46.00	-16.62	QP
867.8409	63.48	-2.13	61.35	80.80	-19.45	peak

Remark:

Factor = Antenna Factor + Correct Factor.  
Correct Factor= Cable Loss – Pre-amplifier



For average Emission

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	AverageLevel dBuV/m	Limit AV	Margin	Polarization
433.92	80.41	-6.38	74.03	80.8	-6.77	Horizontal
867.84	63.53	-6.38	57.15	60.8	-3.65	Horizontal

Notes: 1. Average emission Level = Peak Level + Duty cycle factor  
2. Duty cycle level please see clause 5.

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	AverageLevel dBuV/m	Limit AV	Margin	Polarization
433.92	82.41	-6.38	76.03	80.8	-4.77	Vertical
867.84	61.35	-6.38	54.97	60.8	-5.83	Vertical

Notes: 1. Average emission Level = Peak Level + Duty cycle factor  
2. Duty cycle level please see clause 5.



Radiated Spurious Emission ( 1GHz to 10<sup>th</sup> harmonics)

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit		Margin dB		Polarization
				PK	AV	PK	AV	
1301.72	51.63	-6.38	45.25	80.8	60.8	-29.17	-15.55	Vertical
1735.25	52.01	-6.38	45.63	80.8	60.8	-28.79	-15.17	Vertical
2603.53	50.46	-6.38	44.08	80.8	60.8	-30.34	-16.72	Vertical
3037.45	50.82	-6.38	44.44	80.8	60.8	-29.98	-16.36	Vertical
3471.36	50.06	-6.38	43.68	80.8	60.8	-30.74	-17.12	Vertical
3905.23	47.73	-6.38	41.35	80.8	60.8	-33.07	-19.45	Vertical
1301.72	47.35	-6.38	40.97	80.8	60.8	-33.45	-19.83	Horizontal
1735.25	47.23	-6.38	40.85	80.8	60.8	-33.57	-19.95	Horizontal
2603.53	49.82	-6.38	43.44	80.8	60.8	-30.98	-17.36	Horizontal
3037.45	49.13	-6.38	42.75	80.8	60.8	-31.67	-18.05	Horizontal
3471.36	47.24	-6.38	40.86	80.8	60.8	-33.56	-19.94	Horizontal
3905.23	48.32	-6.38	41.94	80.8	60.8	-32.48	-18.86	Horizontal

Notes: 1.Average emission Level = Peak Level + Duty cycle factor

2.Duty cycle level please see clause 5.

3. Pulse Desensitization Correction Factor

Pulse Width (PW) = 46.56ms

$2/PW = 2/46.56ms = 0.043 \text{ kHz}$

RBW (100 kHz) > 2/PW (0.043 kHz)

Therefore PDCF is not needed

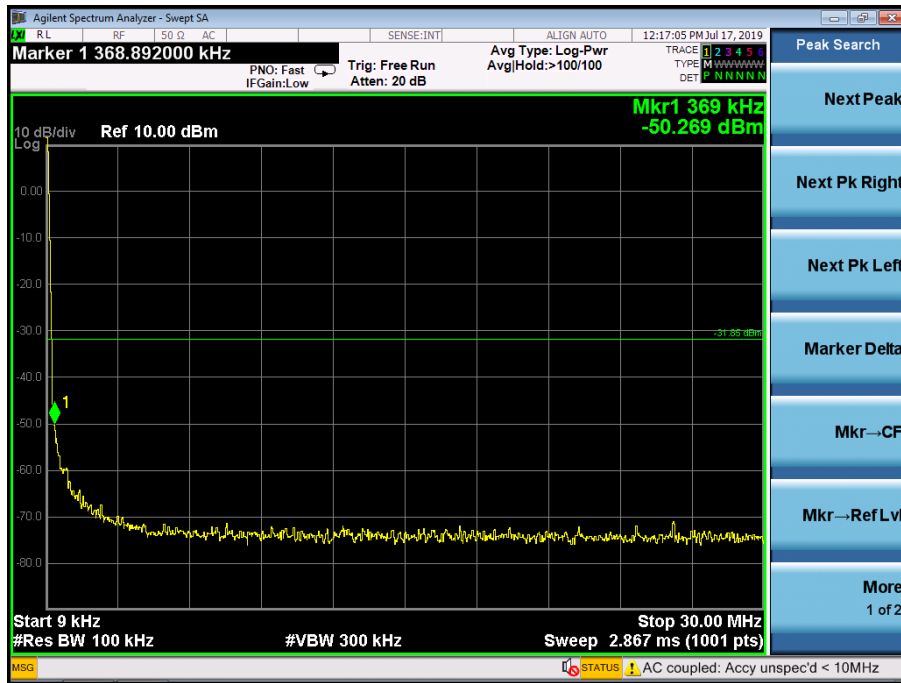
4.Other harmonics emissions are lower than 20dB below the allowable limit.



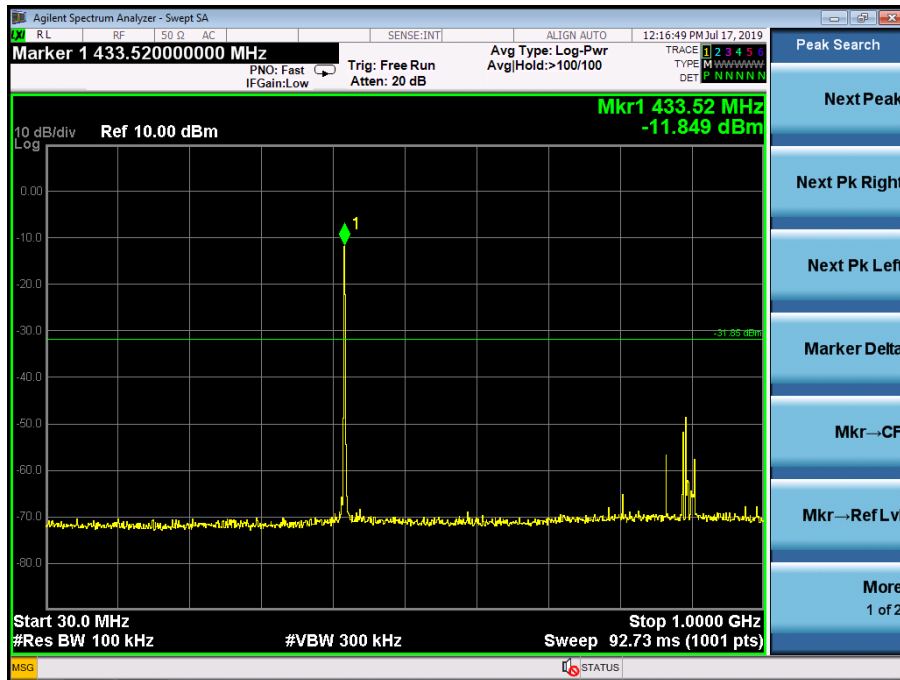


CONDUCTED EMISSION MEASUREMENT

433.92MHz



433.92MHz





## 4. BANDWIDTH TEST

### 4.1 APPLIED PROCEDURES / LIMIT

According to FCC 15.231(c) requirement:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

$$B.W (20dBc) \text{ Limit} = 0.25\% * f(\text{MHz}) = 0.25\% * 433.92\text{MHz} = 1.0848\text{MHz}$$

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30kHz
VB	≥RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

#### 4.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 30kHz, VBW≥ RBW , Sweep time = Auto.

#### 4.1.2 DEVIATION FROM STANDARD

No deviation.

#### 4.1.3 TEST SETUP



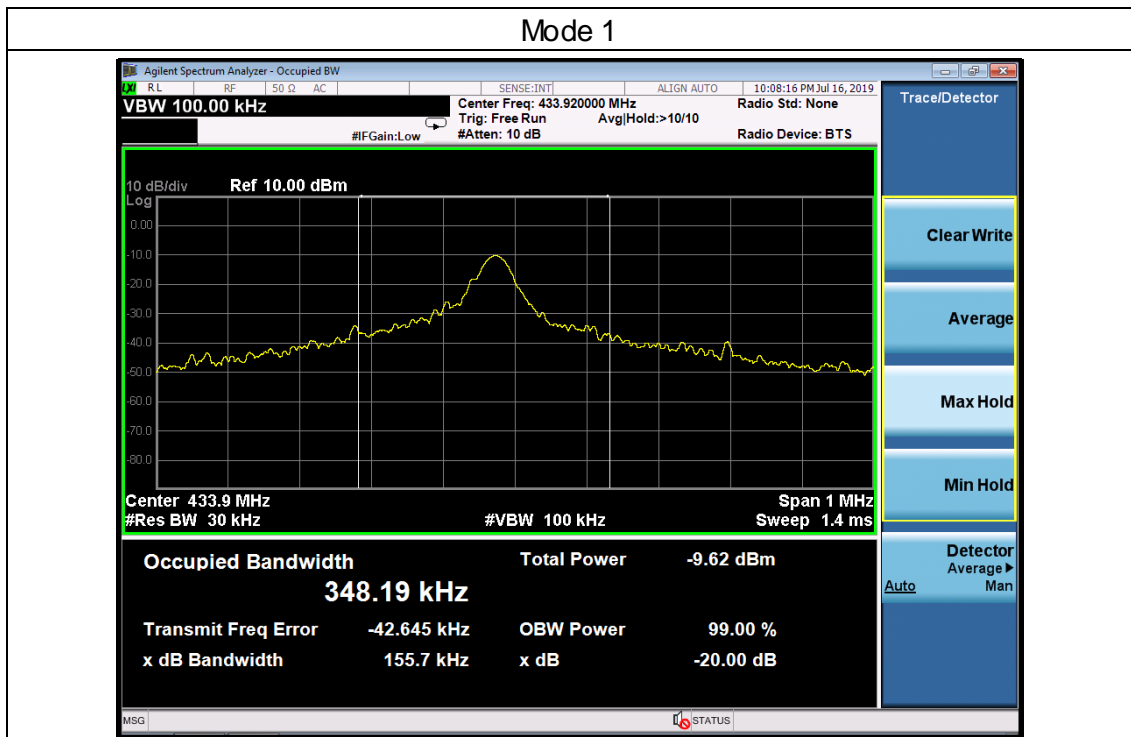
#### 4.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

**4.1.5 TEST RESULTS**

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	DC 3.7V
Test Mode :	TX Mode		

Frequency	20dB Bandwidth (kHz)	Limit (MHz)	Result
433.9MHz	155.7	1.0848	PASS



## 5. CALCULATION OF AVERAGE FACTOR

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

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

The duration of one cycle = 46.56ms

The duty cycle is simply the on-time divided the duration of one cycle

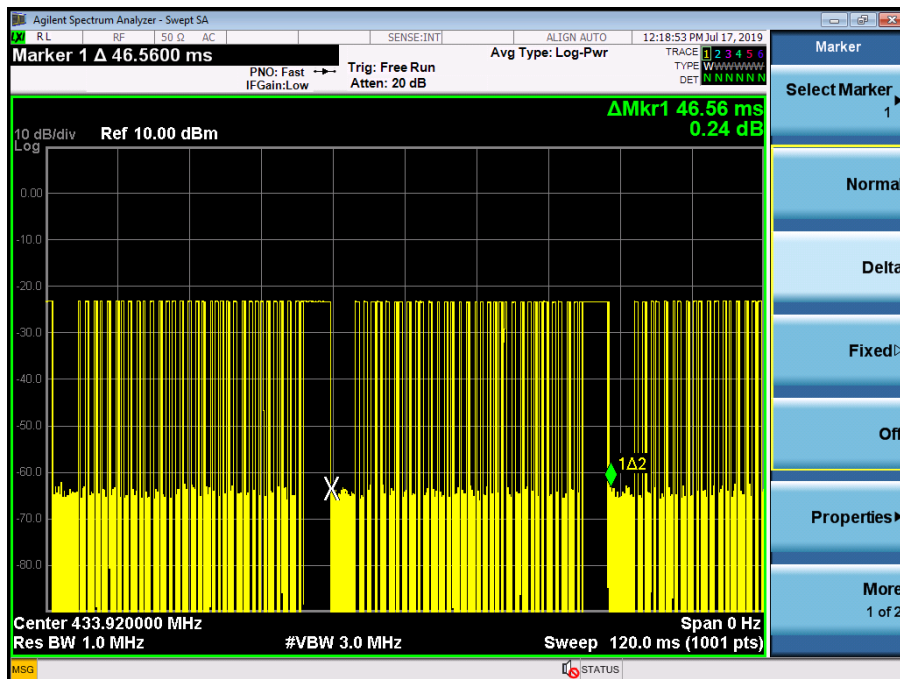
$$\begin{aligned} \text{Duty Cycle} &= (4.86\text{ms} \times 1 + 0.54\text{ms} \times 320) / 46.56 \\ &= 22.14\text{ms} / 46.56\text{ms} \\ &= 0.48 \end{aligned}$$

Therefore, the averaging factor is found by  $20\log 0.48 = -6.38\text{dB}$

Test plot as follows:

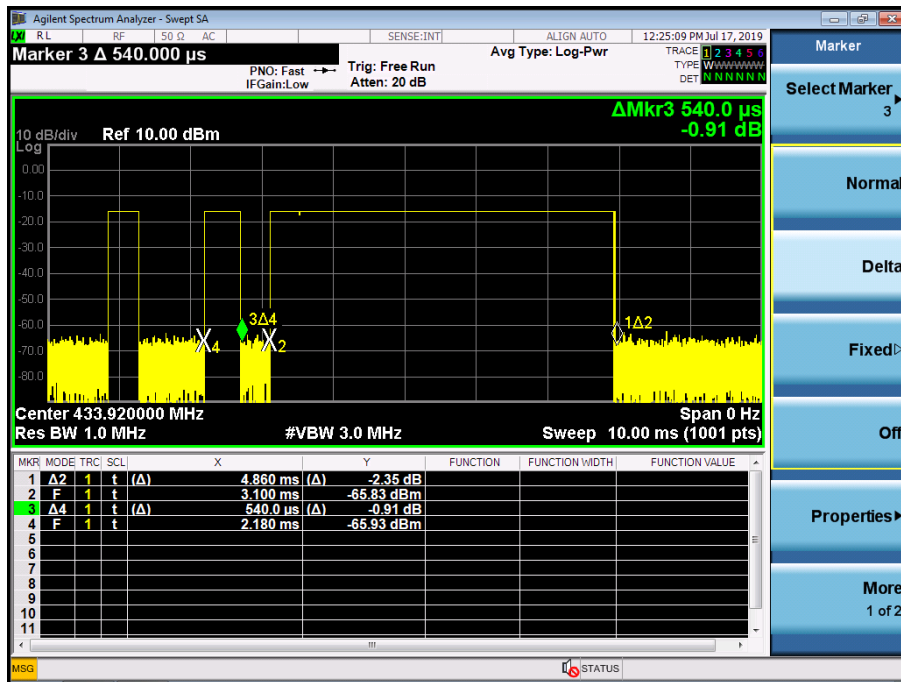
Note: During the 100ms, the amount of pulse and on-time of pulse are the same for every pulse train.

### Cycle

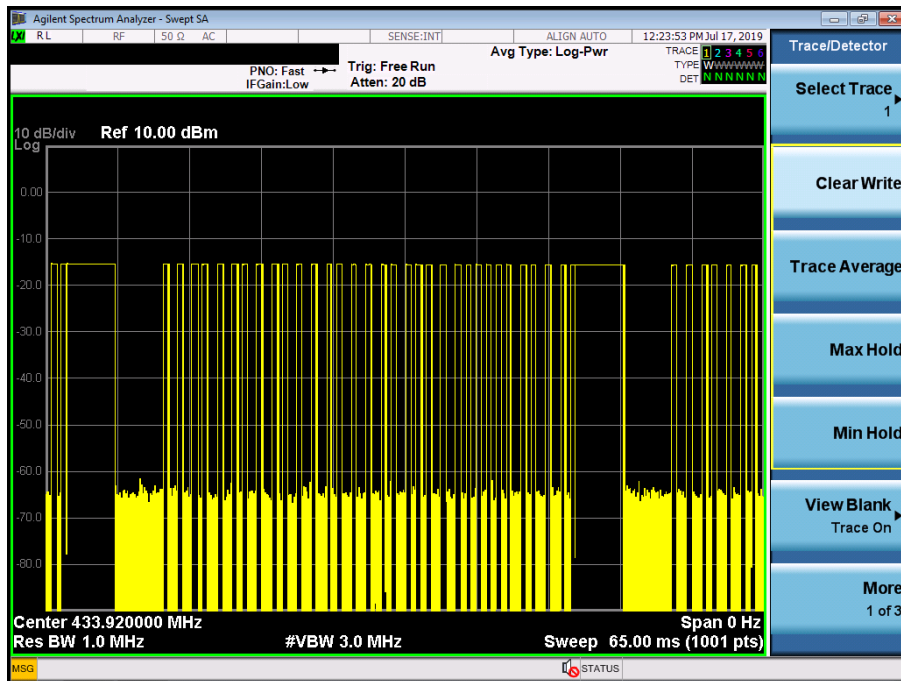




### Pulse



### On-time



## 6. DWELL TIME

### APPLICABLE STANDARD

According to FCC 15.231(a) requirement:

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

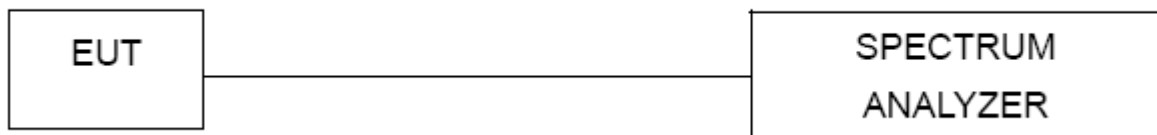
### TEST PROCEDURE

- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- e) Repeat above procedures until all measured frequencies were complete.

### 6.1 DEVIATION FROM STANDARD

No deviation.

### 6.2 TEST SETUP



### 6.3 EUT OPERATION CONDITIONS

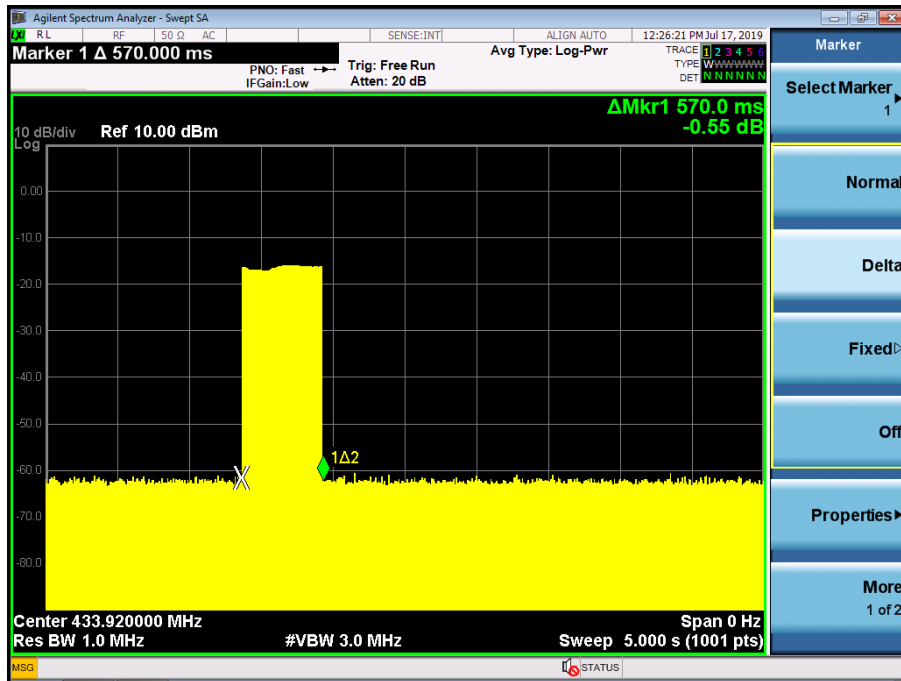
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



### 6.4 TEST RESULTS

Dwell time (second)	Limit (second)	Result
570.0ms	<5s	Pass

Test plot as follows:







## 7. ANTENNA REQUIREMENT

### 7.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

### 7.2 EUT ANTENNA

The EUT antenna is the Spring Antenna. It comply with the standard requirement.



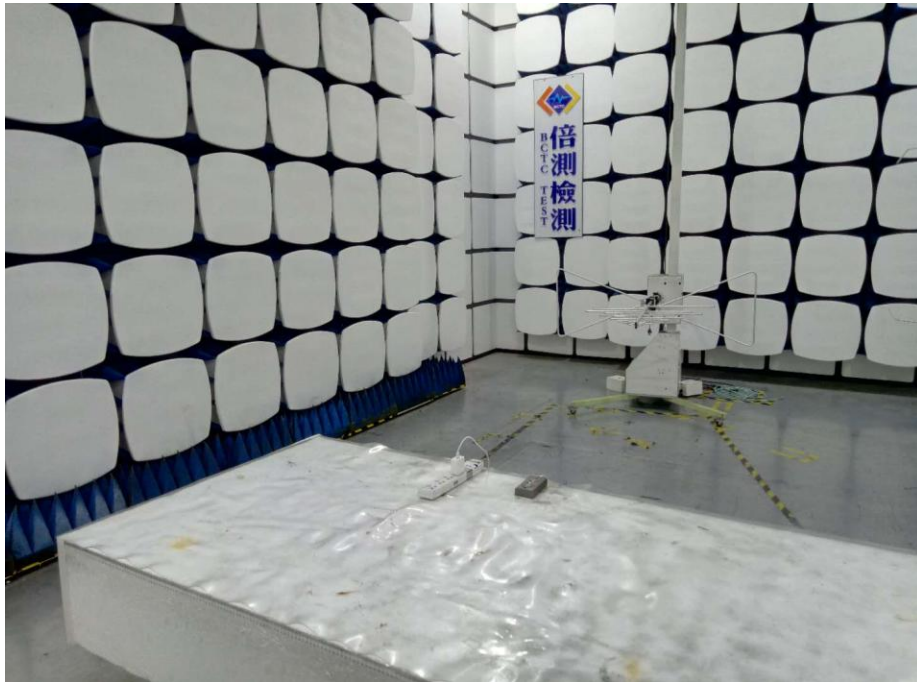
## 8. EUT TEST PHOTO

### Conducted Measurement Photos



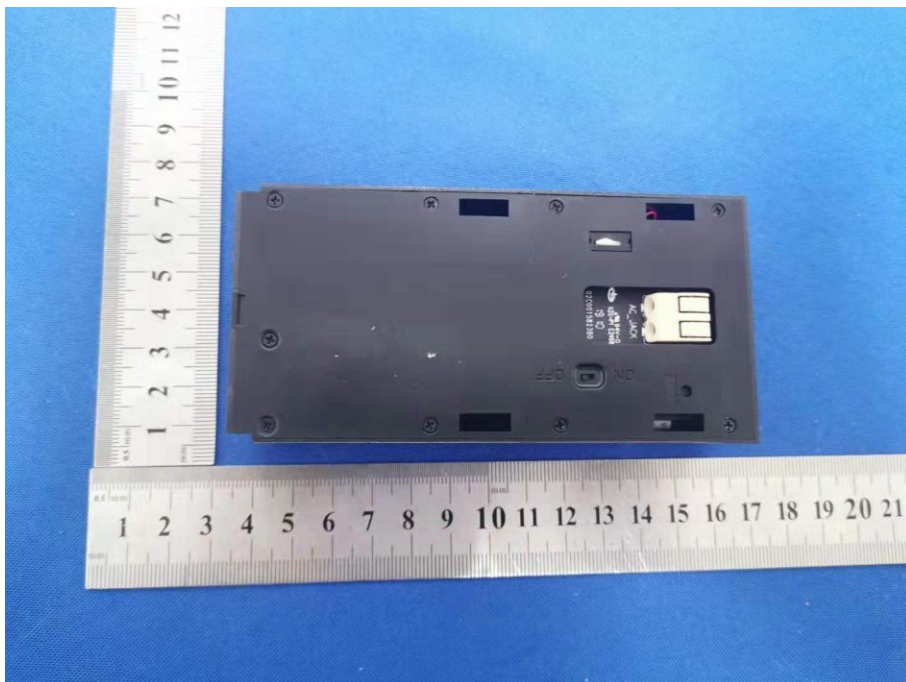


### Radiated Measurement Photos





### 9. EUT PHOTO



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