TEST REPORT

Report No.:	BCTC2111187347E
Applicant:	Shenzhen Patpet Technology Co., Ltd
Product Name:	Dog Trainning Collar
Model/Type Ref.:	p-collar 321
Tested Date:	2021-11-05 to 2021-11-18
Issued Date:	2021-12-09

Shenzhen BCTC Testing Co., Ltd.

FCC ID: 2AHHYP-COLLAR321

Product Name:	Dog Trainning Collar
Trademark:	N/A
Model/Type Ref.:	p-collar 321 p-collar 321A, p-collar 321B, p-collar 322, p-collar 322A, p-collar 322B, p-collar 323, p-collar 323A, p-collar 323B, p-collar 324, p-collar 324A, p-collar 324B, p-collar 325, p-collar 325A, p-collar 325B, p-collar 327, p-collar 327A, p-collar 327B, p-collar 328, p-collar 328A, p-collar 328B, p-collar 329, p-collar 329A, p-collar 329B, p-collar 621, p-collar 621A, p-collar 621B, p-collar 622, p-collar 622A, p-collar 622B, p-collar 623, p-collar 623A, p-collar 623B, p-collar 624, p-collar 624A, p-collar 624B, p-collar 625, p-collar 625A, p-collar 625B, p-collar 626, p-collar 626A, p-collar 626B, p-collar 627, p-collar 627A, p-collar 627B, p-collar 628, p-collar 628A, p-collar 628B, p-collar 641, p-collar 641A, p-collar 641B, p-collar 642, p-collar 642A, p-collar 642B, p-collar 643, p-collar 643A, p-collar 643B, p-collar 645, p-collar 645A, p-collar 645B, p-collar 646, p-collar 646A, p-collar 646B, p-collar 647, p-collar 647A, p-collar 647B, p-collar 648B, p-collar 648A, p-collar 648, p-collar 649, p-collar 649A, p-collar 649B, p-collar 326, p-collar 326A, p-collar 326B
Prepared For:	Shenzhen Patpet Technology Co., Ltd
Address:	No. 59-63, The 2nd Industrial Park, Houting, Shajing Street, Baoan District, Shenzhen City, China.
Manufacturer:	Shenzhen Patpet Technology Co., Ltd
Address:	No. 59-63, The 2nd Industrial Park, Houting, Shajing Street, Baoan District, Shenzhen City, China.
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building SB, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2021-11-05
Sample tested Date:	2021-11-05 to 2021-11-18
Issue Date:	2021-12-09
Report No.:	BCTC2111187347E
Test Standards:	FCC Part15.231 ANSI C63.10-2013
Test Results:	PASS

Tested by:

Jeff.Fu/Project Handler

Approved by:

Zero Zhou/Reviewer

Table Of Content

(Note: N/A Means Not Applicable)

1. Version

Report No.	Issue Date	Description	Approved
BCTC2111187347E	2021-12-09	Original	Valid

2. Test Summary

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No	Results
1	Conducted Emission	§15.207	PASS
2	Fundamental &Radiated Spurious Emission Measurement	15.209,15.231b	PASS
3	Occupy Bandwidth	15.231c	PASS
4	Dwell time	15.231a	PASS
5	Antenna Requirement	15.203	PASS

3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	3m chamber Radiated spurious emission(9kHz-30MHz)	U=3.7dB
2	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.3dB
3	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
4	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
5	Conducted Emission(150kHz-30MHz)	U=3.20dB
6	Conducted Adjacent channel power	U=1.38dB
7	Conducted output power uncertainty Above 1G	U=1.576dB
8	Conducted output power uncertainty below 1G	U=1.28dB
9	humidity uncertainty	U=5.3%
10	Temperature uncertainty	U=0.59℃

4. Product Information And Test Setup

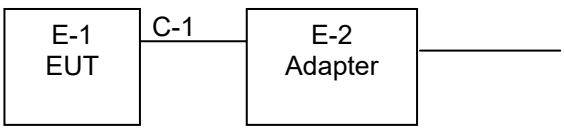
4.1 Product Information

Model/Type Ref.:	p-collar 321 p-collar 321A, p-collar 321B, p-collar 322, p-collar 322A, p-collar 322B, p-collar 323, p-collar 323A, p-collar 323B, p-collar 324, p-collar 324A, p-collar 324B, p-collar 325, p-collar 325A, p-collar 325B, p-collar 327, p-collar 327A, p-collar 327B, p-collar 328, p-collar 328A, p-collar 328B, p-collar 329, p-collar 329A, p-collar 329B, p-collar 621, p-collar 621A, p-collar 621B, p-collar 622, p-collar 622A, p-collar 622B, p-collar 623, p-collar 623A, p-collar 623B, p-collar 624, p-collar 624A, p-collar 624B, p-collar 625, p-collar 625A, p-collar 625B, p-collar 626, p-collar 626A, p-collar 626B, p-collar 627, p-collar 627A, p-collar 627B, p-collar 628, p-collar 628A, p-collar 628B, p-collar 641, p-collar 641A, p-collar 641B, p-collar 642, p-collar 642A, p-collar 642B, p-collar 643, p-collar 643A, p-collar 643B, p-collar 645, p-collar 645A, p-collar 645B, p-collar 646, p-collar 646A, p-collar 646B, p-collar 647, p-collar 647A, p-collar 647B, p-collar 648B, p-collar 648A, p-collar 648, p-collar 649, p-collar 649A, p-collar 649B, p-collar 326, p-collar 326A, p-collar 326B
Model differences:	All the model are the same circuit and RF module, except model names.
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	433.92MHz
Type of Modulation:	ASK
Number Of Channel	1CH
Antenna installation:	Spring antenna
Antenna Gain:	0dBi
Ratings:	DC 3.7V from battery, DC 5V from adapter

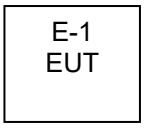
4.2 Test Setup Configuration

See test photographs attached in *EUT TEST SETUP PHOTOGRAPHS* for the actual connections between Product and support equipment.

Conducted Emission:



Radiated Spurious Emission



4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
E-1	Dog Trainning Collar	N/A	p-collar 321	N/A	EUT
E-2	Adapter	N/A	CD122	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	0.5M	USB cable unshielded

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH	Frequency (MHz)
1	433.92

4.5 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Final Test Mode	Description
Mode 1	Charging Mode
Mode 2	TX Mode

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) Fully-charged battery is used during the test mode 2.

5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Tangwei, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

FCC Test Firm Registration Number: 712850

IC Registered No.: 23583

5.2 Test Instrument Used

Conduction Test equipment

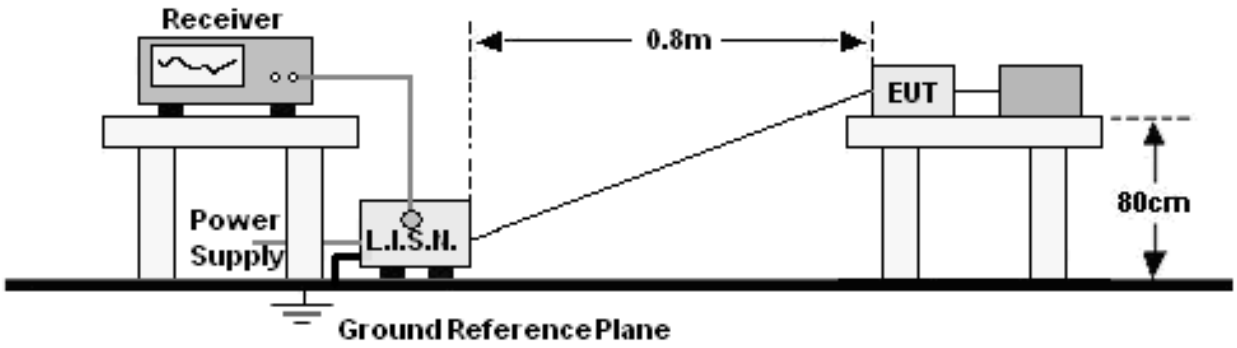
Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESR3	102075	May 28, 2021	May 27, 2022
2	LISN	SCHWARZBECK	NSLK8127	8127739	May 28, 2021	May 27, 2022
3	LISN	R&S	ENV216	101375	May 28, 2021	May 27, 2022
4	RF cables	Huber+Suhnar	9kHz-30MHz	B1702988-0008	May 28, 2021	May 27, 2022
5	Software	Frad	EZ-EMC	EMC-CON 3A1	\	\

Radiation Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4407B	MY45109572	May 28, 2021	May 27, 2022
2	Test Receiver (9kHz-7GHz)	R&S	ESRP	101154	May 28, 2021	May 27, 2022
3	Bilog Antenna (30MHz-3GHz)	SCHWARZBECK	VULB9163	VULB9163-942	Jun. 01, 2021	May 31, 2022
4	Horn Antenna (1GHz-18GHz)	SCHWARZBECK	BBHA9120D	1541	Jun. 02, 2021	Jun. 01, 2022
5	Horn Antenna (18GHz-40GHz)	SCHWARZBECK	BBHA9170	822	Jun. 15, 2021	Jun. 14, 2022
6	Amplifier (9KHz-6GHz)	SCHWARZBECK	BBV9744	9744-0037	May 28, 2021	May 27, 2022
7	Amplifier	SKET	LAPA_01G18G-45dB	\	May 28, 2021	May 27, 2022
8	Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	May 28, 2021	May 27, 2022
9	Loop Antenna (9KHz-30MHz)	SCHWARZBECK	FMZB1519B	014	Jun. 02, 2021	Jun. 01, 2022
10	RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-0008	May 28, 2021	May 27, 2022
11	RF cables2 (30MHz-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	May 28, 2021	May 27, 2022
12	RF cables3 (1GHz-40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	May 28, 2021	May 27, 2022
13	Power Metter	Keysight	E4419B	\	May 28, 2021	May 27, 2022
14	Power Sensor (AV)	Keysight	E9300A	\	May 28, 2021	May 27, 2022
15	Signal Analyzer 20kHz-26.5GHz	KEYSIGHT	N9020A	MY49100060	May 28, 2021	May 27, 2022
16	Test Receiver 9kHz-40GHz	R&S	FSP40	100363	May 28, 2021	May 27, 2022
17	D.C. Power Supply	LongWei	TPR-6405D	\	\	\
18	Signal Generator	Keysight	N5181A	MY50143748	May 29, 2021	May 28, 2022
19	Software	Frad	EZ-EMC	FA-03A2 RE	\	\

6. Conducted Emissions

6.1 Block Diagram Of Test Setup



6.2 Limit

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

Notes:
1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

6.3 Test Procedure

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

a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).

b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.

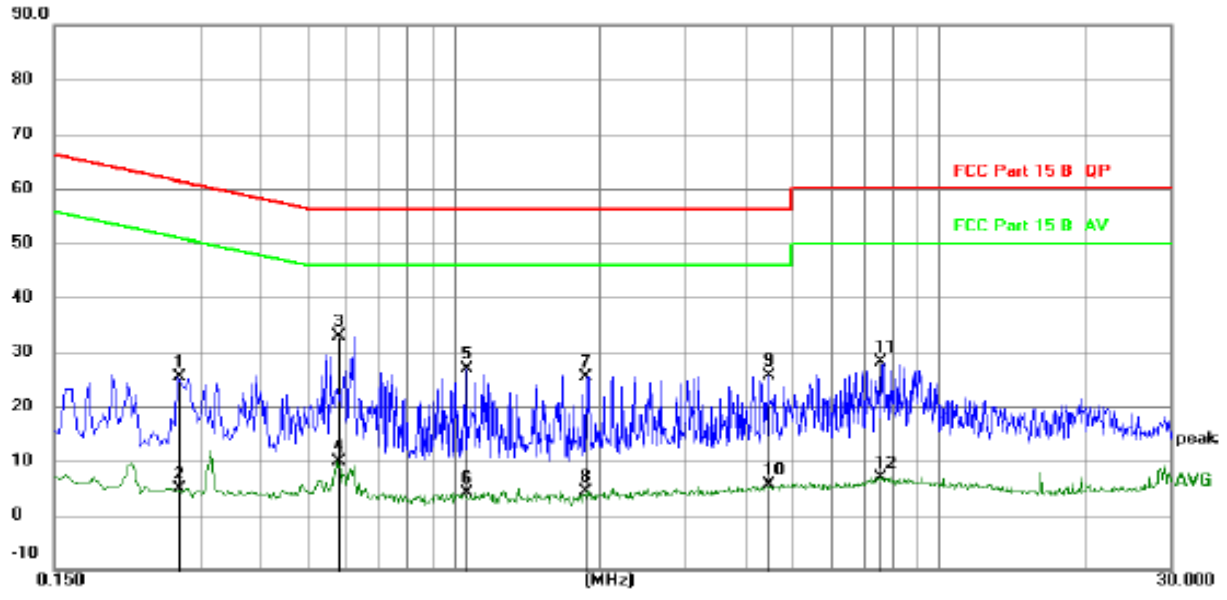
c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

6.4 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.

6.5 Test Result

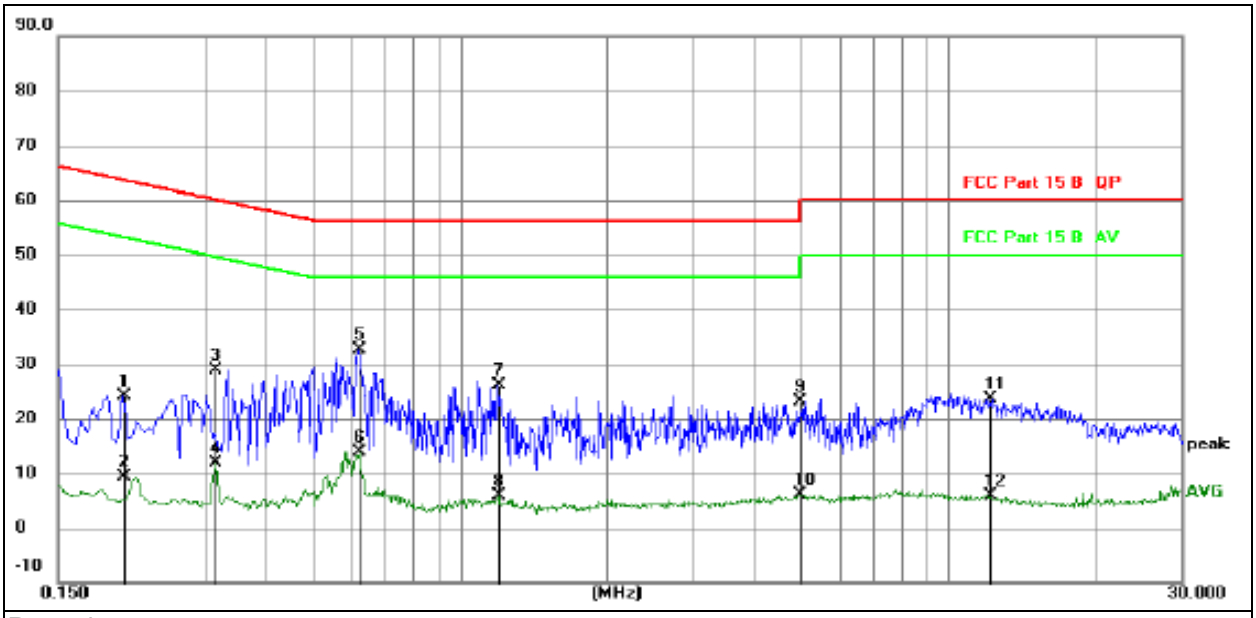
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	Line
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 1



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

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.2701	5.69	19.61	25.30	61.11	-35.81	QP
2		0.2701	-14.77	19.61	4.84	51.11	-46.27	AVG
3	*	0.5762	13.37	19.62	32.99	56.00	-23.01	QP
4		0.5762	-9.68	19.62	9.94	46.00	-36.06	AVG
5		1.0597	7.26	19.63	26.89	56.00	-29.11	QP
6		1.0597	-15.44	19.63	4.19	46.00	-41.81	AVG
7		1.8680	5.74	19.63	25.37	56.00	-30.63	QP
8		1.8680	-15.19	19.63	4.44	46.00	-41.56	AVG
9		4.4540	5.89	19.70	25.59	56.00	-30.41	QP
10		4.4540	-14.00	19.70	5.70	46.00	-40.30	AVG
11		7.5258	8.36	19.75	28.11	60.00	-31.89	QP
12		7.5258	-12.76	19.75	6.99	50.00	-43.01	AVG

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



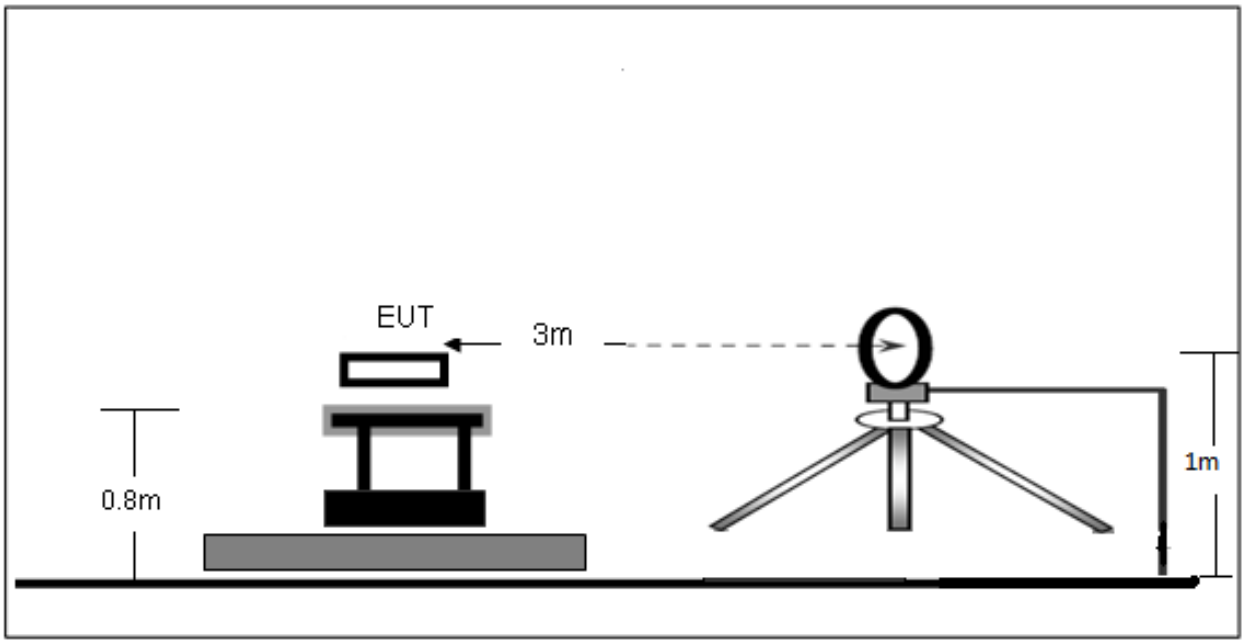
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.2040	4.52	19.61	24.13	63.45	-39.32	QP
2		0.2040	-10.26	19.61	9.35	53.45	-44.10	AVG
3		0.3165	9.29	19.61	28.90	59.80	-30.90	QP
4		0.3165	-7.78	19.61	11.83	49.80	-37.97	AVG
5	*	0.6180	12.90	19.62	32.52	56.00	-23.48	QP
6		0.6180	-5.78	19.62	13.84	46.00	-32.16	AVG
7		1.1940	6.57	19.63	26.20	56.00	-29.80	QP
8		1.1940	-13.75	19.63	5.88	46.00	-40.12	AVG
9		4.9515	3.40	19.71	23.11	56.00	-32.89	QP
10		4.9515	-13.56	19.71	6.15	46.00	-39.85	AVG
11		12.1335	3.94	19.79	23.73	60.00	-36.27	QP
12		12.1335	-13.85	19.79	5.94	50.00	-44.06	AVG

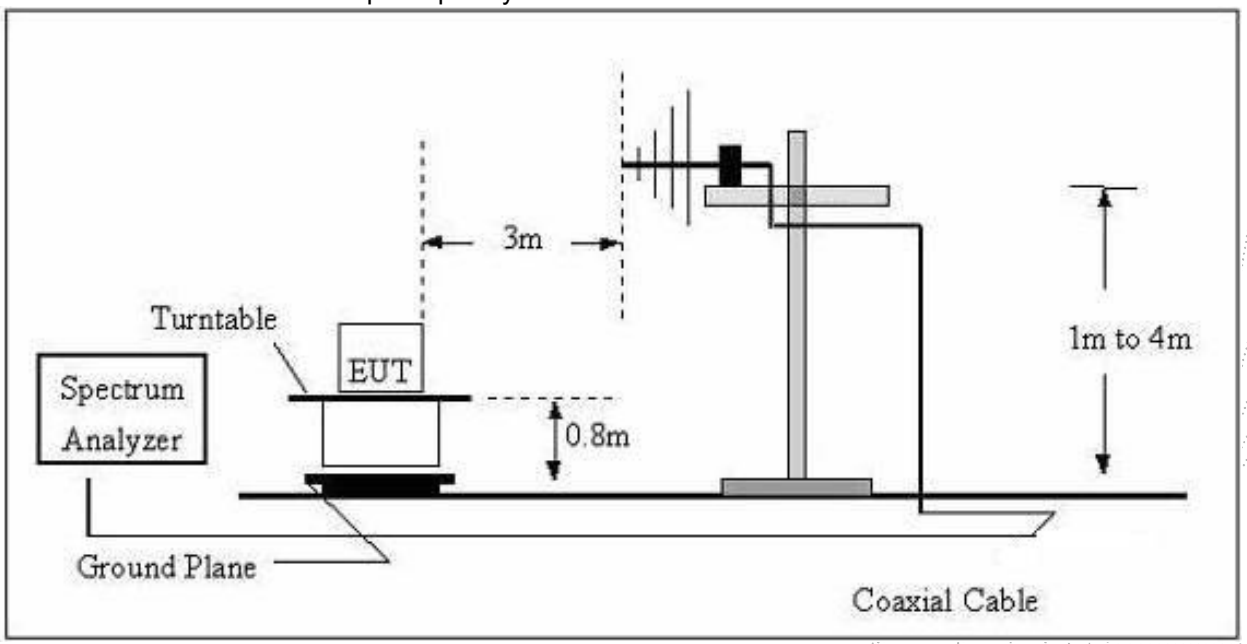
7. Radiated Emissions

7.1 Block Diagram Of Test Setup

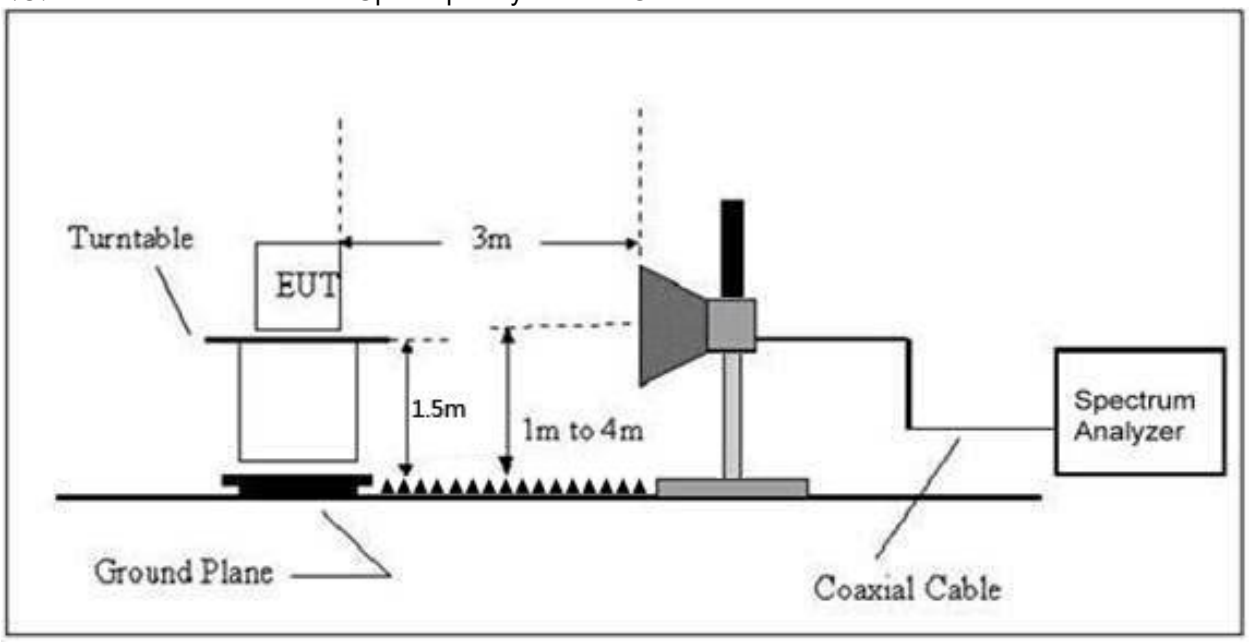
（A）Radiated Emission Test-Up Frequency Below 30MHz



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



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



7.2 Limit

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 15.209(a) limit in the table below has to be followed.

Frequency	Field Strength	Distance	Field Strength Limit at 3m Distance	
(MHz)	uV/m	(m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))}$ + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))}$ + 40
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)}$ + 40
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

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).

For manually operated within 5sec,activated automatically within 5sec,periodic transmission.

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]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250
40.66-40.70	2,250	225

FREQUENCY RANGE OF RADIATED MEASUREMENT
(a) For an intentional radiator
the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:
(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
(4) If the intentional radiator operates at or above 95 GHz: To the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
(5) If the intentional radiator contains a digital device, regardless of whether this digital
device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a) (1)through (4) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

7.3 Test Procedure

Receiver Parameter	Setting
Attenuation	Auto
9kHz~150kHz	RBW 200Hz for QP
150kHz~30MHz	RBW 9kHz for QP
30MHz~1000MHz	RBW 120kHz for QP

Spectrum Parameter	Setting
1-6GHz	RBW 1 MHz /VBW 1 MHz for Peak, RBW 1 MHz / VBW 10Hz for Average

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT has only one channel.

Note:

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

7.4 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.

7.5 Test Result

Below 30MHz

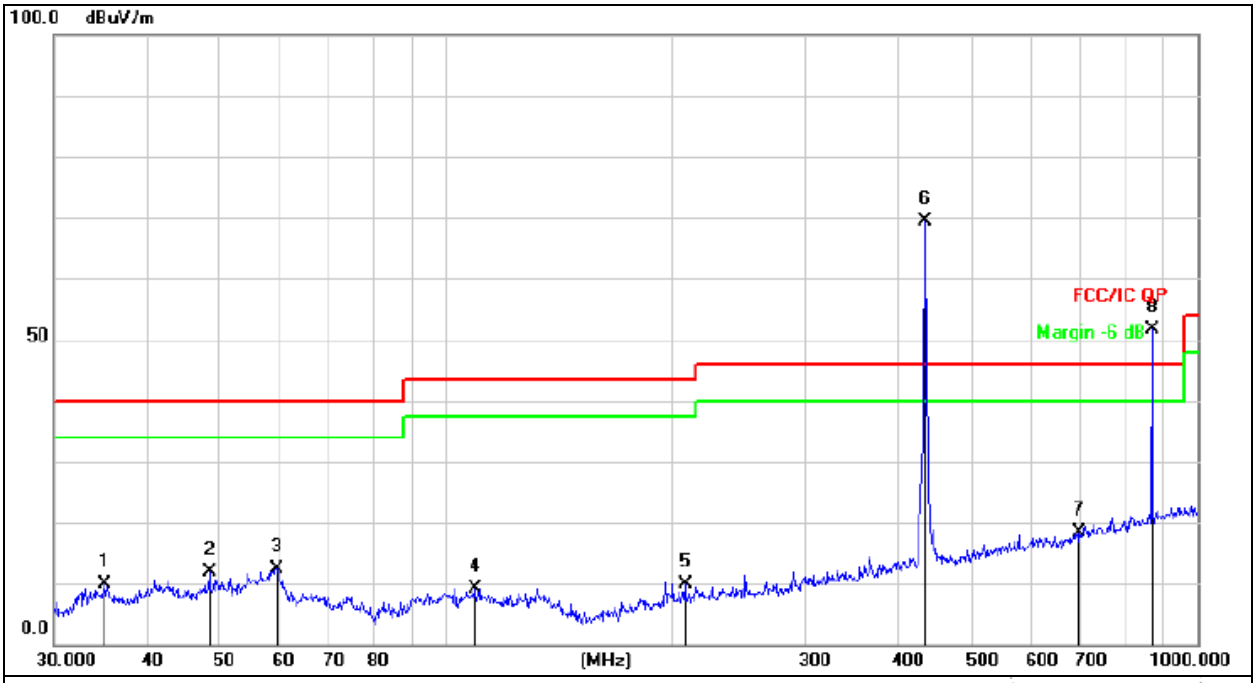
Temperature：	26℃	Relative Humidtity：	24%
Pressure：	101 kPa	Test Voltage ：	DC 3.7V
Test Mode ：	Mode 2	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	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 (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

Between 30MHz – 1GHz

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Horizontal
Test Mode:	Mode 2	Remark:	N/A

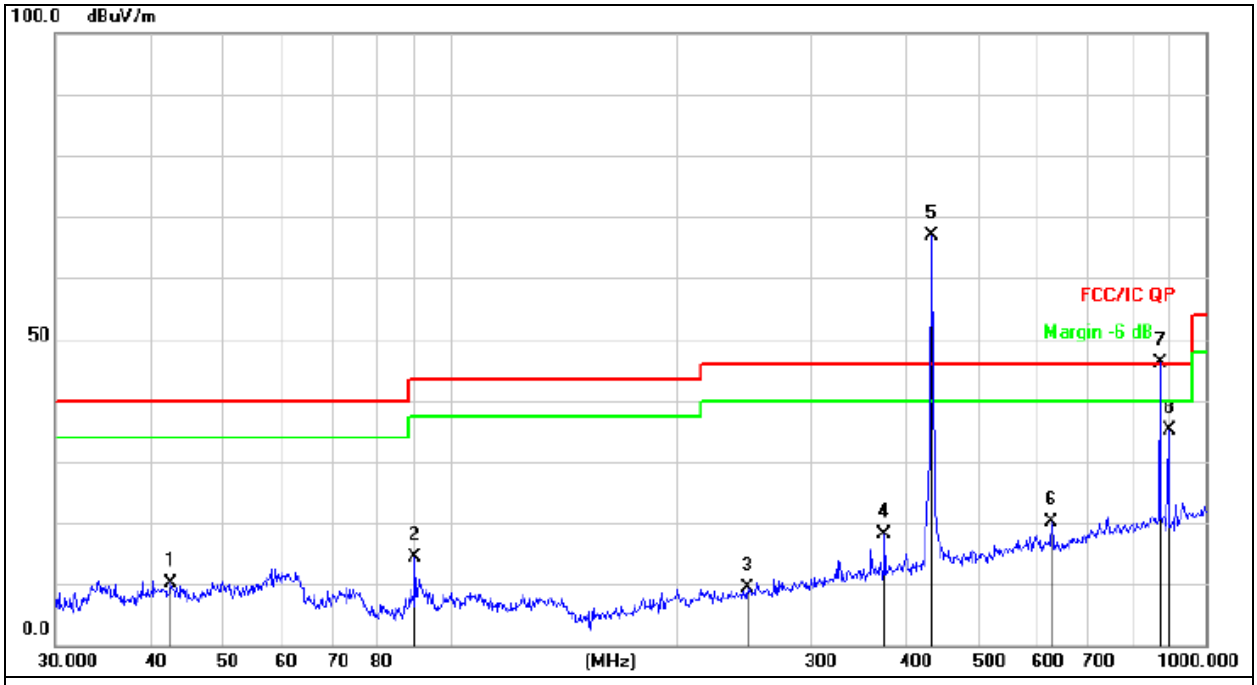


Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		35.1278	26.24	-16.32	9.92	40.00	-30.08	QP
2		48.3318	26.92	-14.94	11.98	40.00	-28.02	QP
3		59.4405	28.23	-15.85	12.38	40.00	-27.62	QP
4		109.0286	26.04	-16.86	9.18	43.50	-34.32	QP
5		207.8501	26.03	-16.12	9.91	43.50	-33.59	QP
6	*	434.0651	79.70	-10.33	69.37	100.83	23.37	peak
7		696.8567	23.58	-5.24	18.34	46.00	-27.66	QP
8	X	869.1302	53.79	-2.13	51.66	80.83	5.66	peak

Note: MARK 6 is Field Strength of Fundamental and MARK 8 is Field Strength of Spurious Emissions;

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	Mode 2	Remark:	N/A



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		42.6000	25.40	-15.26	10.14	40.00	-29.86	QP
2		89.9047	32.61	-18.12	14.49	43.50	-29.01	QP
3		247.6819	24.49	-15.20	9.29	46.00	-36.71	QP
4		375.9384	29.74	-11.64	18.10	46.00	-27.90	QP
5	*	434.0651	77.14	-10.33	66.81	100.83	20.81	peak
6		625.0779	26.84	-6.67	20.17	46.00	-25.83	QP
7	X	869.1302	48.17	-2.13	46.04	80.83	0.04	peak
8		893.8567	36.84	-1.63	35.21	46.00	-10.79	QP

Note: MARK 5 is Field Strength of Fundamental and MARK 7 is Field Strength of Spurious Emissions;

For average Emission

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit AV	Margin	Polarization
433.92	69.37	-7.13	62.24	80.83	-18.59	Horizontal
867.84	51.66	-7.13	44.53	60.83	-16.30	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	Average Level dBuV/m	Limit AV	Margin	Polarization
433.92	66.81	-7.13	59.68	80.83	-21.15	Vertical
867.84	46.04	-7.13	38.91	60.83	-21.92	Vertical

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

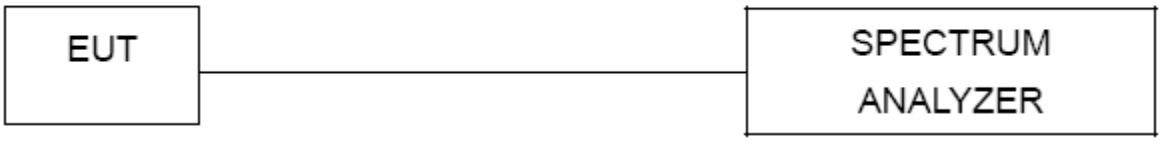
Radiated Spurious Emission (1GHz to 10th harmonics)

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit		Margin dB		Polarization
				PK	AV	PK	AV	
1301.76	51.54	-7.13	44.41	80.83	60.83	-29.29	-16.42	Vertical
1735.68	52.27	-7.13	45.14	80.83	60.83	-28.56	-15.69	Vertical
2603.52	51.55	-7.13	44.42	80.83	60.83	-29.28	-16.41	Vertical
3037.44	52.36	-7.13	45.23	80.83	60.83	-28.47	-15.60	Vertical
3471.36	50.15	-7.13	43.02	80.83	60.83	-30.68	-17.81	Vertical
3905.28	47.52	-7.13	40.39	80.83	60.83	-33.31	-20.44	Vertical
1301.76	47.44	-7.13	40.31	80.83	60.83	-33.39	-20.52	Horizontal
1735.68	47.56	-7.13	40.43	80.83	60.83	-33.27	-20.40	Horizontal
2603.52	49.51	-7.13	42.38	80.83	60.83	-31.32	-18.45	Horizontal
3037.44	49.38	-7.13	42.25	80.83	60.83	-31.45	-18.58	Horizontal
3471.36	47.23	-7.13	40.10	80.83	60.83	-33.60	-20.73	Horizontal
3905.28	48.59	-7.13	41.46	80.83	60.83	-32.24	-19.37	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) = 43.2ms
RBW =1 MHz
PW (43.20ms)> 1/RBW (1us)
Therefore PDCF is not needed
4.Other harmonics emissions are lower than 20dB below the allowable limit.

8. Bandwidth Test

8.1 Block Diagram Of Test Setup



8.2 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) Limit = 0.25% * f(MHz) = 0.25% * 433.92MHz = 1.0848MHz

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	1%-5% OBW
VB	≥RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.3 Test Procedure

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 1%-5% OBW, VBW≥ RBW, Sweep time = Auto.

8.4 EUT Operating Conditions

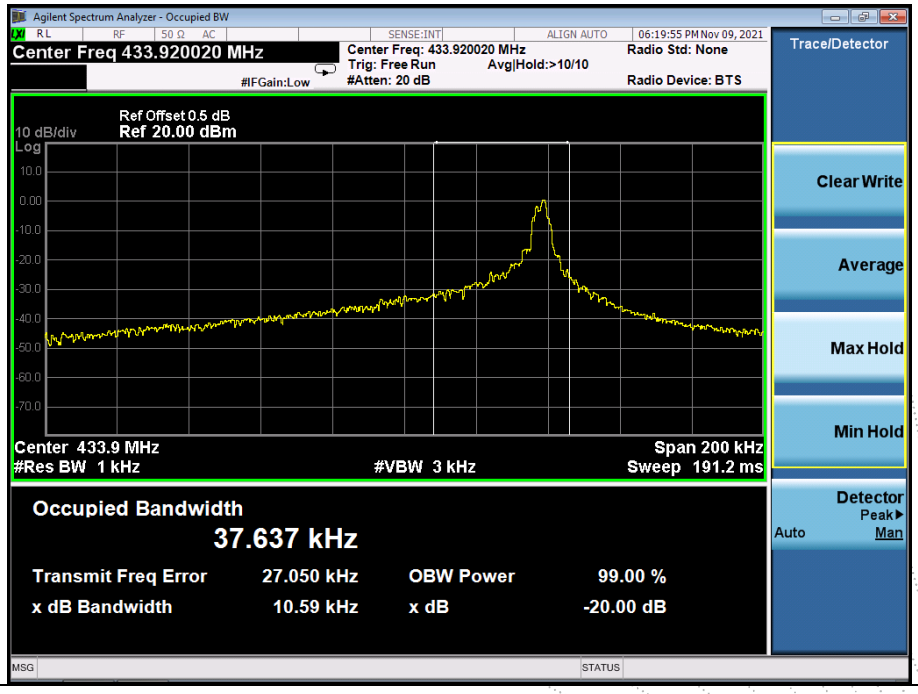
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.5 Test Result

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Test Voltage ：	DC 3.7V
Test Mode ：	Mode 2		

Frequency	20dB Bandwidth (kHz)	Limit (MHz)	Result
433.92MHz	10.59	1.0848	PASS

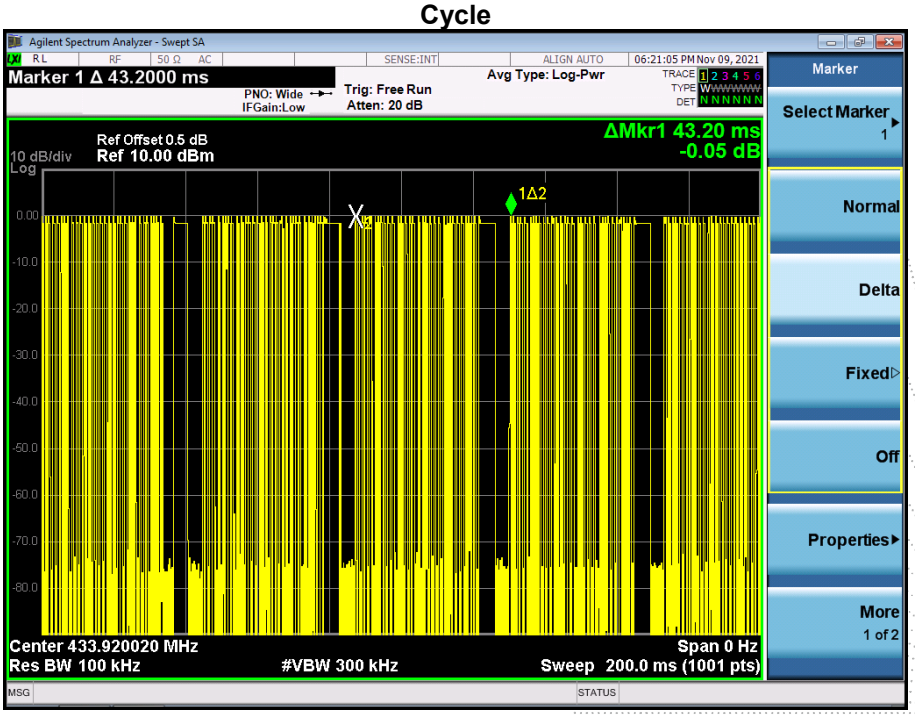
Mode 1



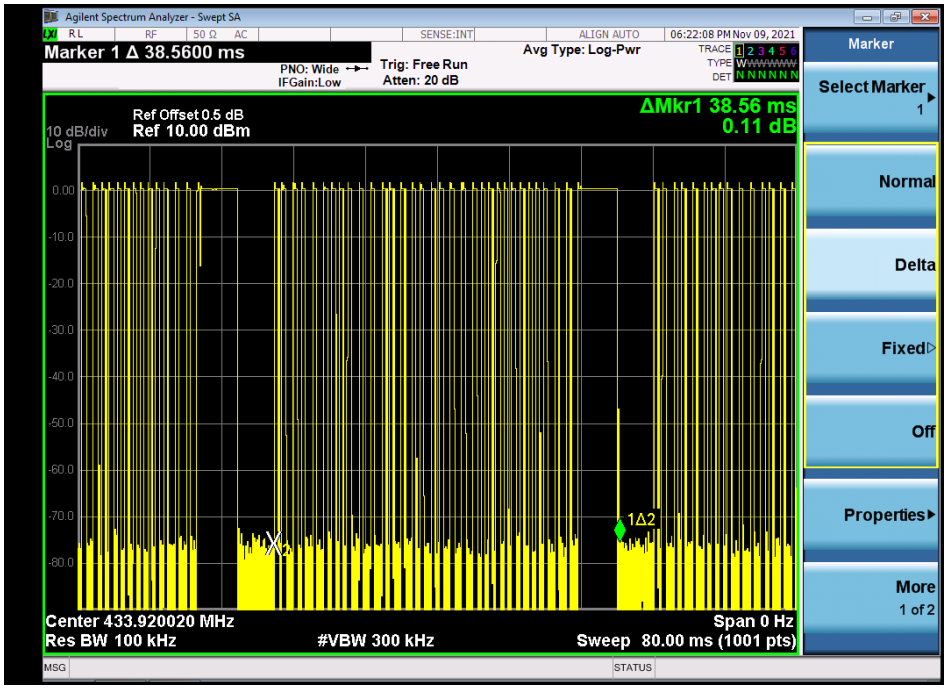
9. Calculation Of Average Factor

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 =20log (duty cycle)
The duration of one cycle =43.2ms
The duty cycle is simply the on-time divided the duration of one cycle
Duty Cycle = (0.46ms*32+4.5ms*1)/ 43.2ms
=19.22ms / 43.2ms
=0.44
Therefore, the averaging factor is found by 20log0.44=-7.13dB
Test plot as follows:
Note: During the 100ms, the amount of pulse and on-time of pulse are the same for every pulse train.

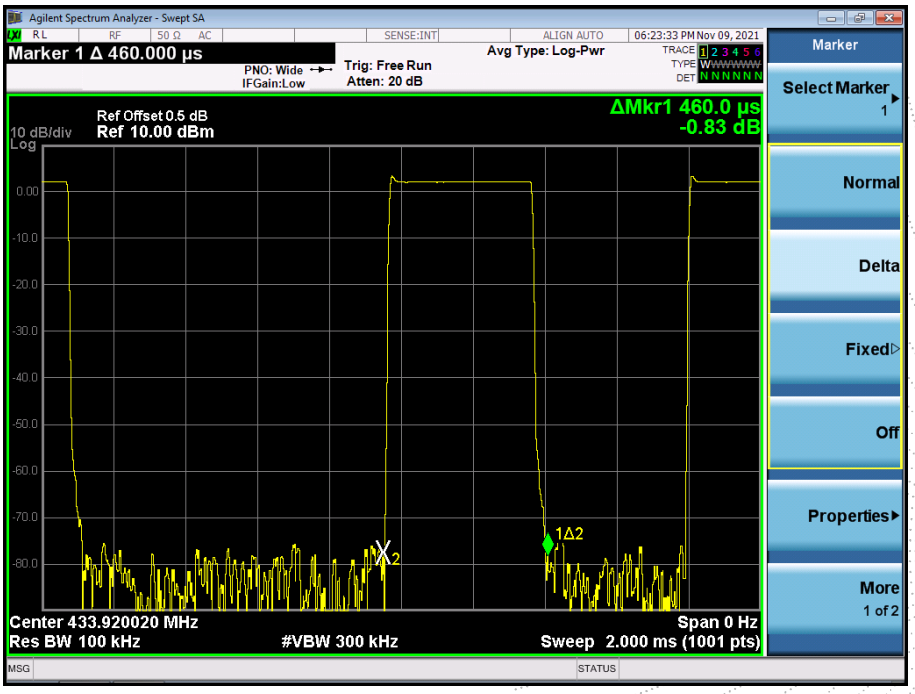
Cycle

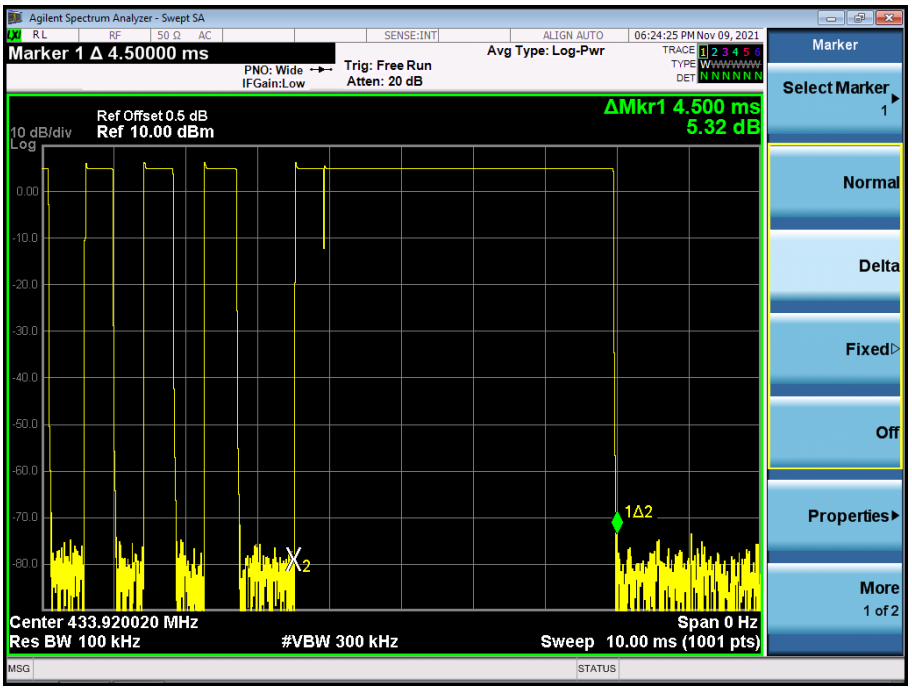


Pulse



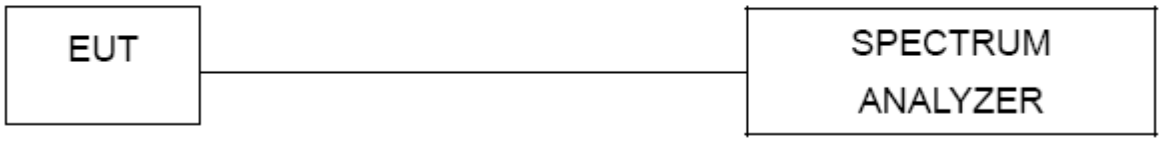
On-time




Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 4.50000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
06:24:25 PM Nov 09, 2021
Ref Offset 0.5 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 4.500 ms
5.32 dB
1Δ2
Center 433.920020 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 10.00 ms (1001 pts)
Marker
Select Marker
1
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS

10. Dwell Time

10.1 Block Diagram Of Test Setup



10.2 Limit

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.

10.3 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.

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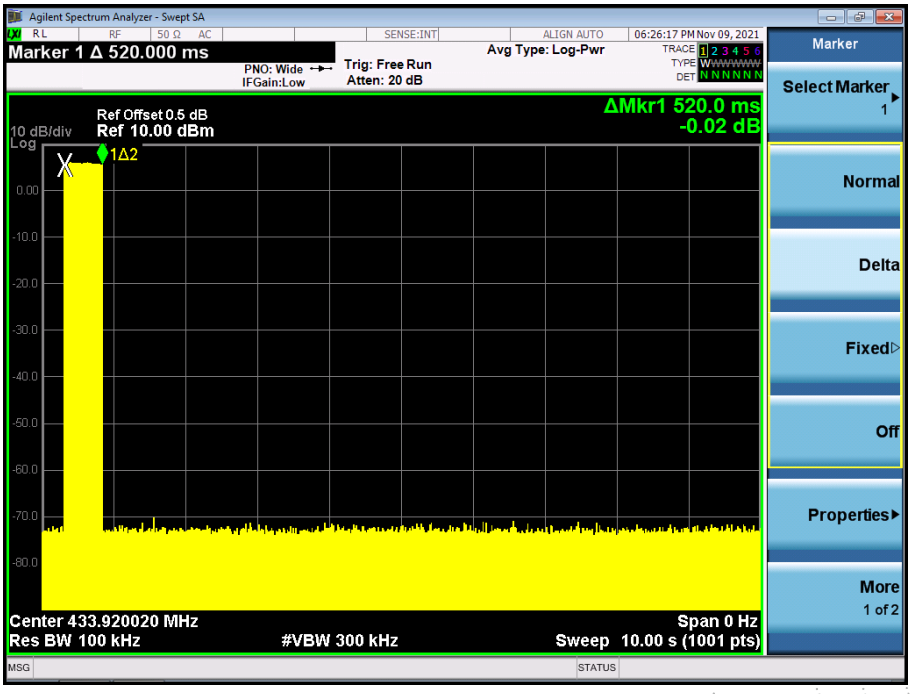
10.4 Test Result

Dwell time (second)	Limit (second)	Result
520.0ms	<5s	Pass

Test plot as follows:



11. Antenna Requirement

11.1 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.

11.2 EUT Antenna

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

12. EUT Photographs

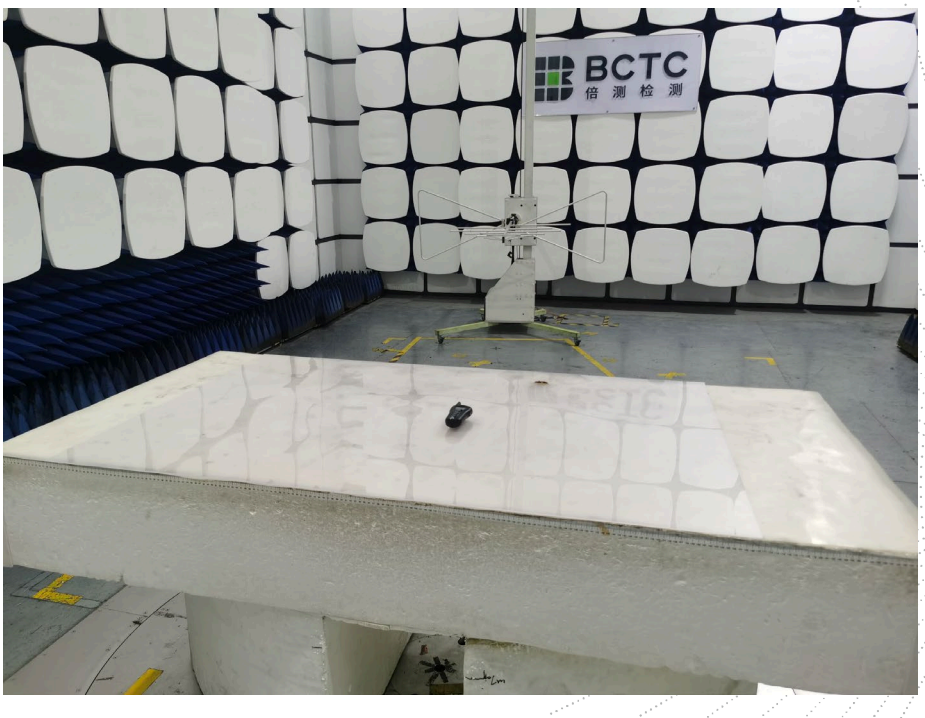
EUT Photo 1

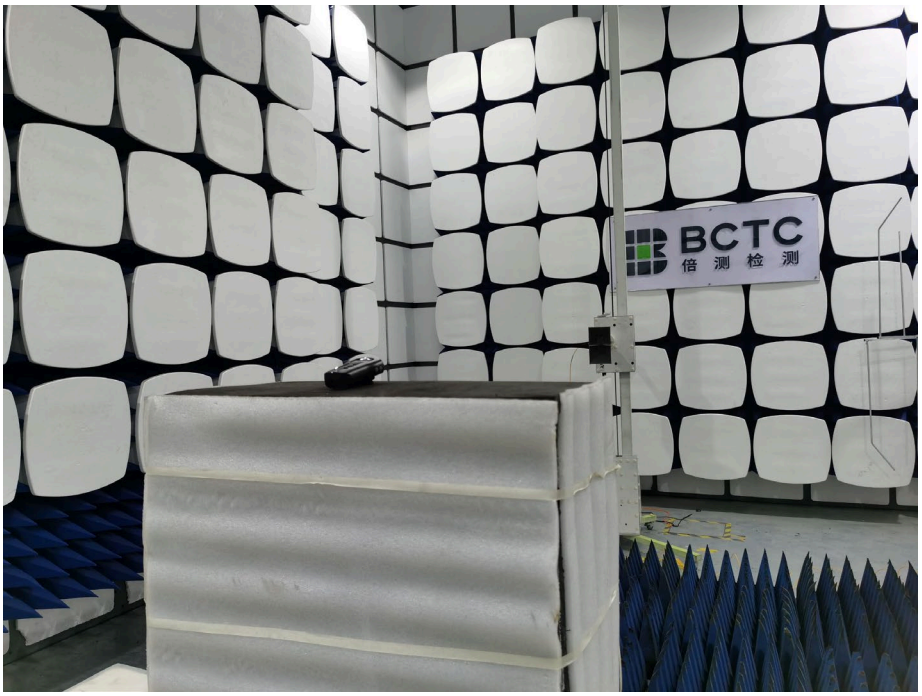
EUT Photo 2

13. EUT Test Setup Photographs

Conducted emissions

Radiated Measurement Photos




BCTC
倍 测 检 测

STATEMENT

1.The equipment lists are traceable to the national reference standards.

2.The test report can not be partially copied unless prior written approval is issued from our lab.

3.The test report is invalid without stamp of laboratory.

4.The test report is invalid without signature of person(s) testing and authorizing.

5.The test process and test result is only related to the Unit Under Test.

6.The quality system of our laboratory is in accordance with ISO/IEC17025.

7.If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:
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TEL：400-788-9558

P.C.: 518103

FAX：0755-33229357

Website：http://www.chnbctc.com

E-Mail：bctc@bctc-lab.com.cn

※※※※※ **END** ※※※※※