TEST REPORT

Applicant	Guangzhou Bresser Optical Instruments Co., Ltd.
Address	No.12 Kangda RD., Dongcheng Zone, Yunpu Industrial District, Huangpu, Guangzhou, China

Manufacturer or Supplier	N/A
Address	N/A
Product	Color weather station w/sensor
Brand Name	N/A
Model	70-07510
Additional Model & Model Difference	N/A
Date of tests	Jul. 06, 2020 ~ Jul. 28, 2020

the tests have been carried out according to the requirements of the following standards:

☒ **FCC Part 15, Subpart C, Section 15.231e**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

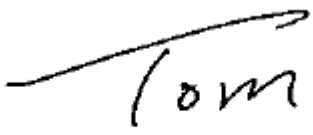
Tested by Tom Chen Project Engineer / EMC Department	Approved by Glyn He Assistant Manager / EMC Department
	 Date: Aug. 28, 2020

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF200706N041	Original release	Aug. 28, 2020

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.231)			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
§15.203	Antenna Requirement	PASS	No antenna connector is used
§15.207 (a)	AC Power Conducted Emission	N/A	EUT is powered by battery
§15.209 §15.231(e)	Radiated Emission	PASS	Compliant
§15.231 (e)	Deactivation Testing	PASS	Compliant
§15.231(c)	20dB Bandwidth Test	PASS	Compliant

2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.67dB
Radiated emissions	9KHz ~ 30MHz	2.16dB
	30MHz ~ 1GHz	3.60dB
	1GHz ~ 18GHz	4.82dB
	18GHz ~ 40GHz	5.00dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Color weather station w/sensor
MODEL NO.	70-07510
FCC ID	2AE3N-7007510
NOMINAL VOLTAGE	DC 3V (1.5V*AAA*2) from Battery
MODULATION TYPE	ASK
OPERATING FREQUENCY	433.92MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Spring Antenna
I/O PORTS	Refer to the user's manual

NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.:200706N041) for detailed product photo.

3.2 DESCRIPTION OF TEST MODES

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on Y plane for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

FREQUENCY	TEST MODES
433.92MHz	Transmitting

3.3 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO						DESCRIPTION
	RE ≥ 1G	RE < 1G	PLC	EB	DT	DC	
-	√	√	-	√	√	√	DC 3V from New Battery

Where **RE ≥ 1G:** Radiated Emission above 1GHz **RE < 1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **EB:** 20dB Bandwidth measurement
DT: Deactivation Time measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery.

POWER LINE CONDUCTED EMISSION TEST:

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☐ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	1	ASK

RADIATED EMISSION TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	1	ASK

EMISSION BANDWIDTH MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	1	ASK

DEACTIVATION TIME MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	1	ASK

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE≥1G	23deg. C, 54%RH	DC 3V from New Battery	Allen
RE<1G	23deg. C, 54%RH	DC 3V from New Battery	Allen
EB	25deg. C, 60%RH	DC 3V from New Battery	Daniel
DT	25deg. C, 60%RH	DC 3V from New Battery	Daniel

3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C Section 15.231e
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

3.5 DESCRIPTION OF SUPPORT UNITS

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.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	N/A	N/A	N/A	N/A	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A

4. TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/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

According to §15.231(e), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66–40.70	1,000	100
70–130	500	50
130–174	500 to 1,500[1]	50 to 150[1]
174–260	1,500	150
260–470	1,500 to 5,000[1]	150 to 500[1]
Above 470	5,000	500

NOTE:

1. [1] Linear interpolations.
2. The lower limit shall apply at the transition frequencies.
3. Emission level (dBuV/m) = 20 log Emission level (uV/m).
4. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU40	100449	Mar. 18,20	Mar. 17,21
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	May 22,20	May 21,21
Active Loop Antenna (9KHz -30MHz)	SCHWARZBECK	FMZB 1519B	1519B-045	May 28,20	May 27,21
Amplifier (9KHz -1GHz)	Burgeon	BPA-530	100210	Mar. 15,20	Mar. 14,21
Bilog Antenna (20MHz -2GHz)	Teseq	CBL 6111D	30643	Jun. 23,20	Jun. 22,21
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Jun. 23,20	Jun. 22,21
Horn Antenna (18GHz -40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170147	Jun. 23,20	Jun. 22,21
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Apr. 21,20	Apr. 20,21
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
Broadband Preamplifier (1GHz~18GHz)	SCHWARZBECK	BBV9718	305	Apr. 21,20	Apr. 20,21
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Mar. 04,20	Mar. 03,21
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

NOTES:

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above1GHz if tested.
4. The FCC Site Registration No. is 502831.

4.1.3 TEST PROCEDURES

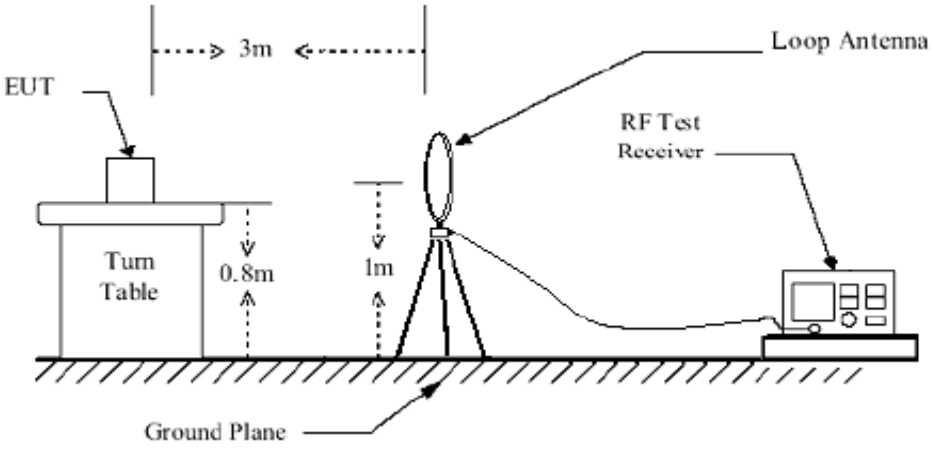
a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna is a broadband antenna, and its 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 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 lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position Y, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using new battery. The turntable was rotated to maximize the emission level.
h. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.

NOTES:

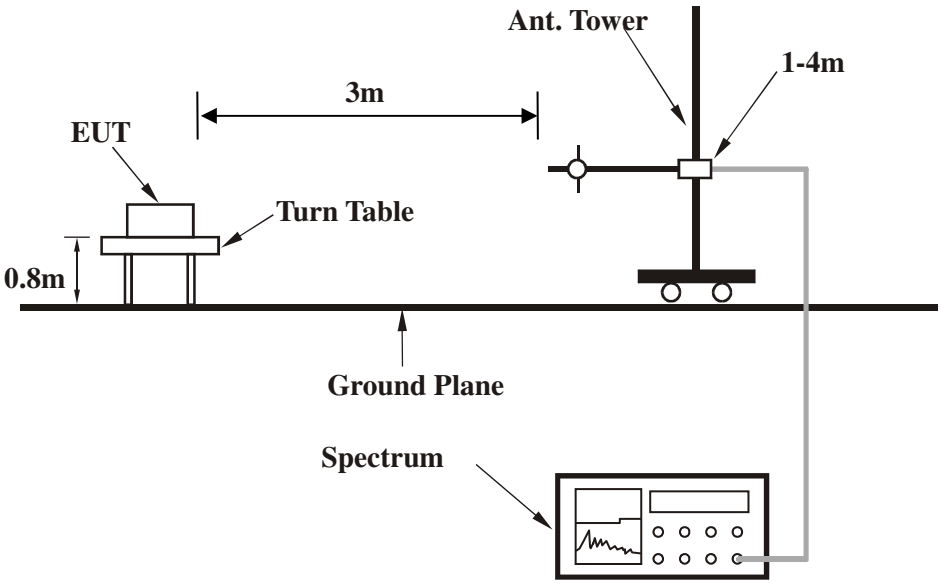
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. Fundamental AV value =PK Emission +20*log(duty cycle)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 TEST SETUP

Below 30MHz

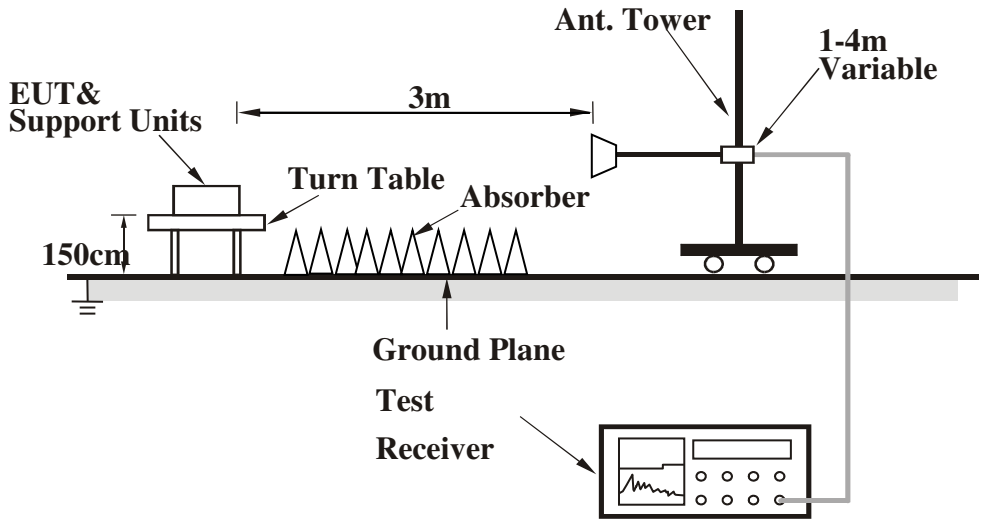


Below 1GHz test setup



Note: For the actual test configuration, please refer to the attached file (Test Setup Photo).

Above 1GHz test setup



Note: For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.5 EUT OPERATING CONDITIONS

a. Turned on the power of all equipment.

b. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

4.1.6 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	31.55 QP	-12.72	30.00	17.28	40.00	-22.72	2.00 H	0
2	79.74 QP	-22.23	37.03	14.80	40.00	-25.20	2.00 H	270
3	*433.92 PK	-10.95	90.99	80.04	92.87	-12.83	2.00 H	58
4	*433.92 AV	-	-	64.55	72.87	-8.32	2.00 H	127
5	779.26 QP	-3.54	28.73	25.19	46.00	-20.81	2.00 H	27
6	#867.84 PK	1.35	30.29	31.64	72.87	-41.23	2.00 H	90
7	#867.84 AV	-	-	16.15	52.87	-36.72	2.00 H	90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	31.55 QP	-12.72	29.83	17.11	40.00	-22.89	1.00 V	110
2	85.96 QP	-21.38	35.00	13.62	40.00	-26.38	1.00 V	0
3	*433.92 PK	-10.95	90.25	79.30	92.87	-13.00	1.00 V	312
4	*433.92 AV	-	-	63.81	72.87	-9.06	1.00 V	88
5	662.68 QP	-5.82	29.67	23.85	46.00	-22.15	1.00 V	334
6	#867.84 PK	1.35	33.62	34.97	72.87	-37.90	1.00 V	0
7	#867.84 AV	-	-	19.48	52.87	-33.39	1.00 V	0

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) at frequency below 1GHz.
2. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": Harmonic frequency
7. Fundamental AV value =PK Emission +20*log(duty cycle)Where the duty factor is calculated from following formula:20 log (Duty cycle) = 20 log (16.80%) = -15.49dB, Please see page 17 for plotted duty.
8. The emission levels of other frequencies were less than 20dB margin against the limit.

ABOVE 1GHz WORST-CASE DATA:

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	#1301.76PK	-3.63	44.34	40.71	74.00	-33.29	1.00 H	18
2	#1301.76AV	-	-	25.22	54.00	-28.78	1.00 H	200
3	#1735.68PK	-0.68	43.69	43.01	72.87	-29.86	1.00 H	40
4	#1735.68AV	-	-	27.52	52.87	-25.35	1.00 H	100
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	#1301.76PK	-3.63	43.03	39.40	74.00	-34.60	1.00 V	214
2	#1301.76AV	-	-	23.91	54.00	-30.09	1.00 V	11
3	#1735.68PK	-0.68	42.70	42.02	72.87	-30.85	1.00 V	0
4	#1735.68AV	-	-	26.53	52.87	-26.34	1.00 V	55

NOTE:

1 The resolution bandwidth of test receiver/spectrum analyzer is 1MHz for Peak detection (PK) at frequency above 1GHz.

2 Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)

3 Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)

4 Margin value = Emission level – Limit value.

5 " # ": Harmonic frequency

6 Fundamental AV value =PK Emission +20*log(duty cycle)Where the duty factor is calculated from following formula:20 log (Duty cycle) = 20 log (16.80%) = -15.49dB, Please see page 17 for plotted duty.

Duty Cycle:

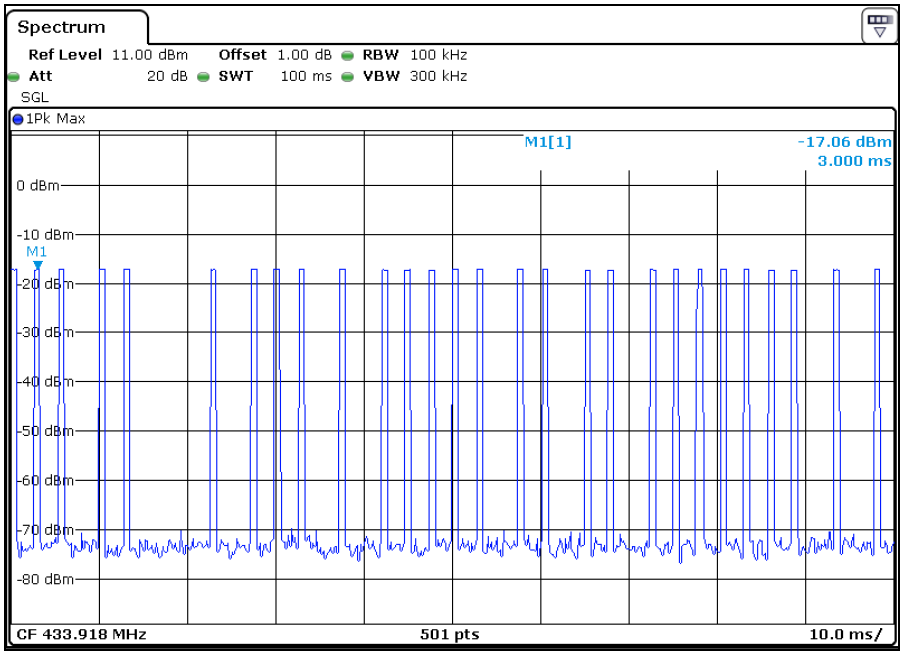
Tp = 100ms

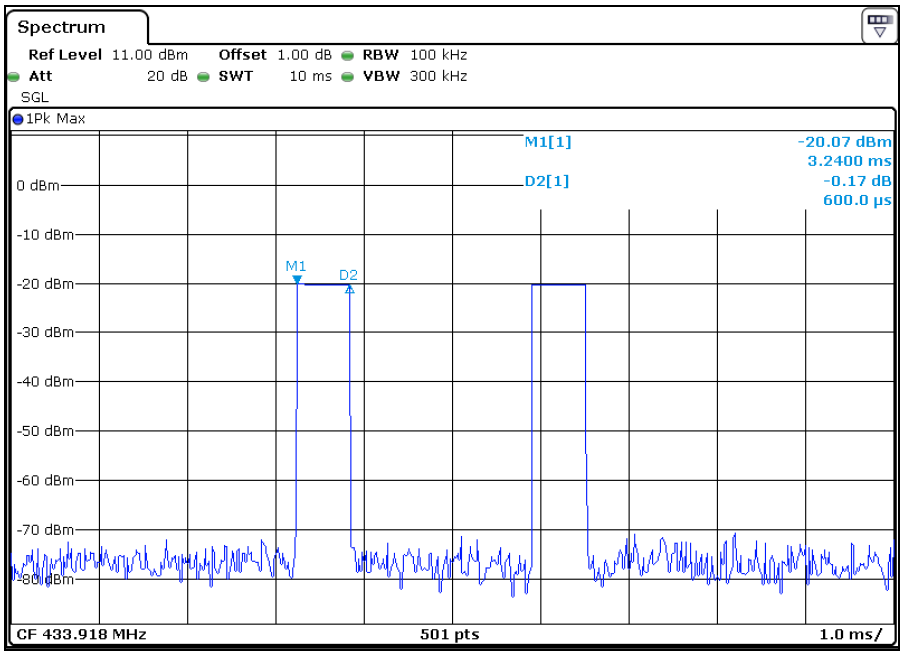
Ton = Ton1 * Number =0.6*28 = 16.8ms

Duty Cycle = Ton / Tp * 100% = 16.8 / 100 * 100%= 16.80%

Factor = 20Log(Duty Cycle)=20Log(16.80%)= -15.49dB

Tp





4.2 20dB BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF 20dB BANDWIDTH MEASUREMENT

According to FCC 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.

Limit=Fundamental Frequency×0.25%=433.92MHz×0.25%=1084.8 kHz

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Sensor	Keysight	U2021XA	MY55060016	May 22,20	May 21,21
Power Sensor	Keysight	U2021XA	MY55060018	May 22,20	May 21,21
Power Meter	Anritsu	ML2495A	1139001	Mar. 18,20	Mar. 17,21
Power Sensor	Anritsu	MA2411B	1531155	Mar. 18,20	Mar. 17,21
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 17, 19	Oct.16, 20
Humid & Temp Programmable Tester	Haida	HD-225T	110807201	Oct.31,19	Oct. 30,20
Oscilloscope	Agilent	DSO9254A	MY51260160	Sep. 18,19	Sep. 17,20
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101094	Mar. 18,20	Mar. 17,21
Signal Generator	Agilent	N5183A	MY50140980	Sep. 19,19	Sep. 18,20
MXG-B RF Vector Signal Generator	Keysight	N5182B	MY56200288	Sep. 12,19	Sep. 11,20
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A	N/A
DC Source	Keysight	E3642A	MY56146098	N/A	N/A

NOTE: 1. The test was performed in RF Oven room.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.2.3 TEST PROCEDURE

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

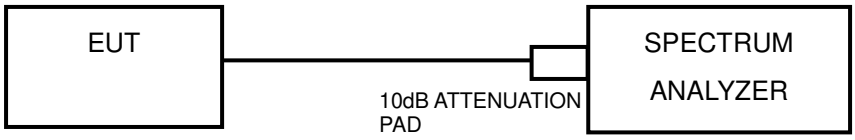
b. Turn on the EUT and connect it to measurement instrument. Then set the frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



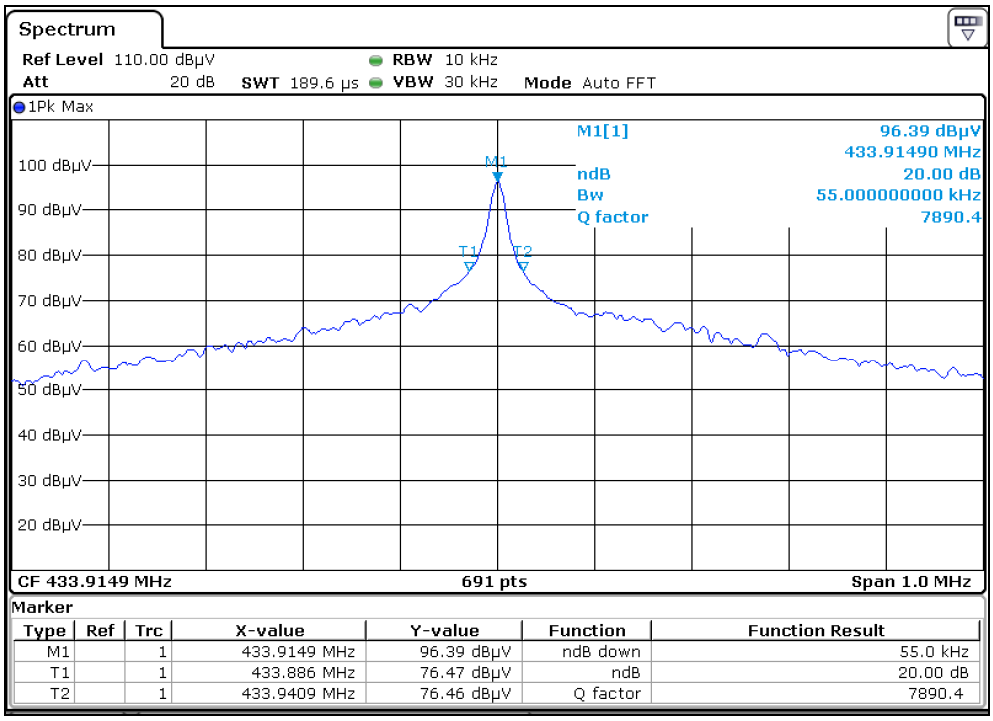
4.2.6 EUT OPERATING CONDITIONS

a. Placed the EUT on the testing table.
b. Enable EUT under transmission condition continuously at specific channel frequency.

4.2.7 TEST RESULTS

FREQUENCY (MHz)	20dB BANDWIDTH (kHz)	MAXIMUM LIMIT (kHz)	PASS/FAIL
433.92	55	1084.8	PASS

Test Data:



4.3 DEACTIVATION TIME MEASUREMENT

4.3.1 LIMITS OF DEACTIVATION TIME MEASUREMENT

According to FCC 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.

4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Sensor	Keysight	U2021XA	MY55060016	May 22,20	May 21,21
Power Sensor	Keysight	U2021XA	MY55060018	May 22,20	May 21,21
Power Meter	Anritsu	ML2495A	1139001	Mar. 18,20	Mar. 17,21
Power Sensor	Anritsu	MA2411B	1531155	Mar. 18,20	Mar. 17,21
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 17, 19	Oct.16, 20
Humid & Temp Programmable Tester	Haida	HD-225T	110807201	Oct.31,19	Oct. 30,20
Oscilloscope	Agilent	DSO9254A	MY51260160	Sep. 18,19	Sep. 17,20
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101094	Mar. 18,20	Mar. 17,21
Signal Generator	Agilent	N5183A	MY50140980	Sep. 19,19	Sep. 18,20
MXG-B RF Vector Signal Generator	Keysight	N5182B	MY56200288	Sep. 12,19	Sep. 11,20
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A	N/A
DC Source	Keysight	E3642A	MY56146098	N/A	N/A

NOTE: 1. The test was performed in RF Oven room.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

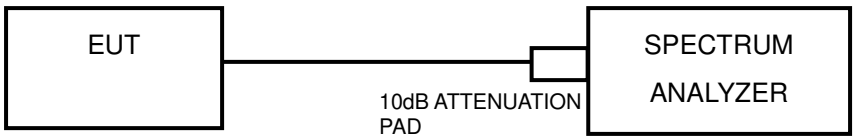
4.3.3 TEST PROCEDURE

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, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the transmission duration was measured and recorded.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP

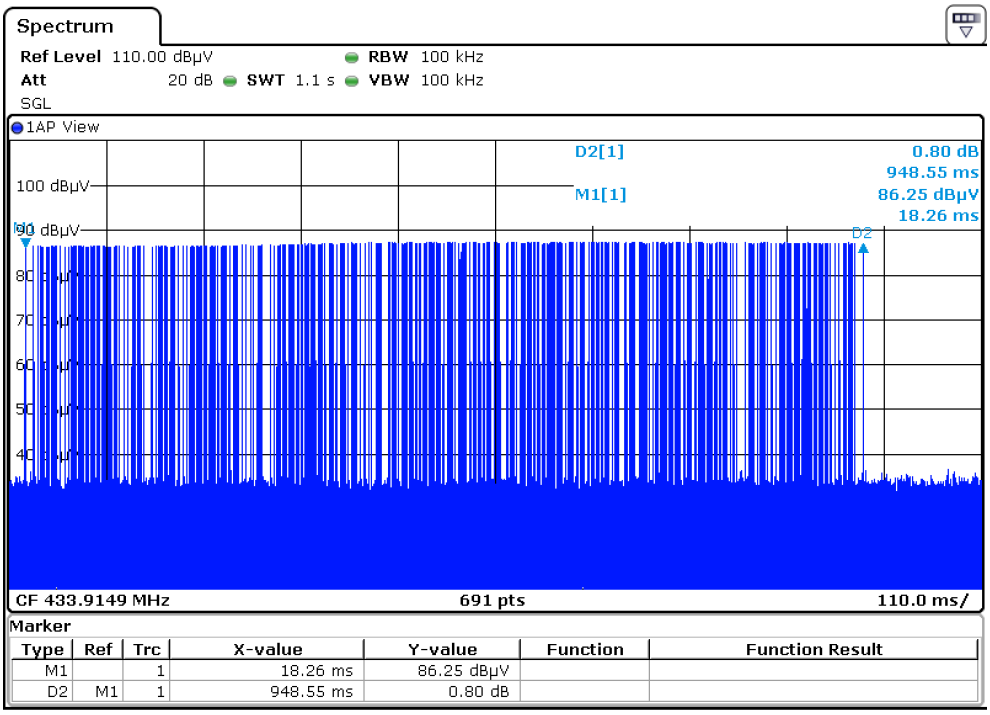


4.3.6 EUT OPERATING CONDITIONS

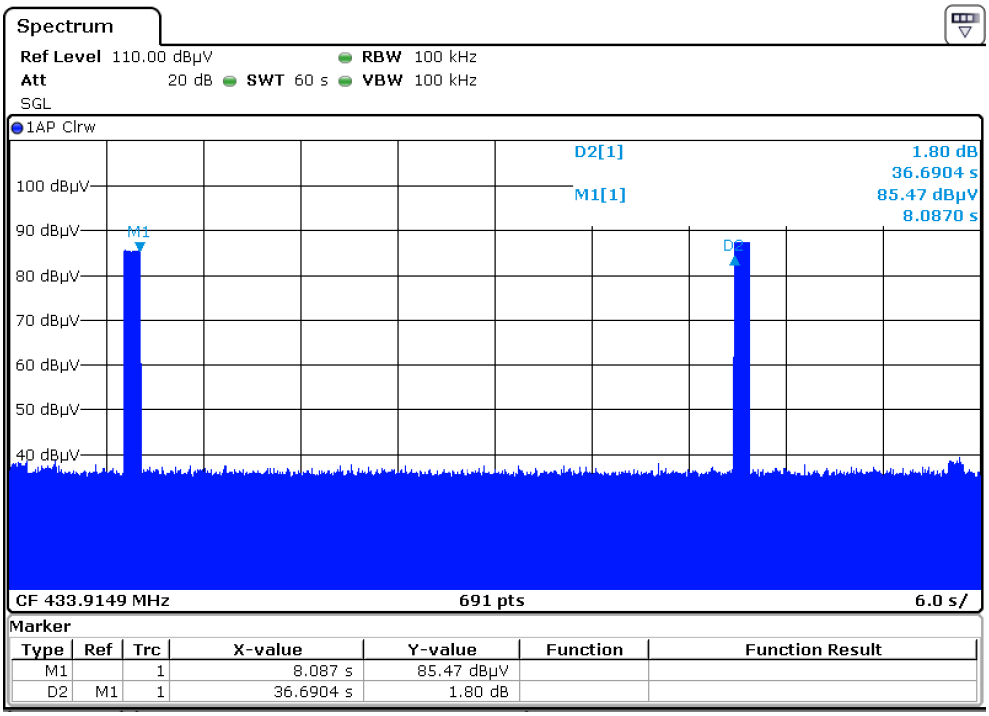
a. Placed the EUT on the testing table.
b. With the EUT's antenna attached, which was connected to the spectrum analyzer set to the EUT's operation frequencies.

4.3.7 TEST RESULTS

Test Data: Duration=948.55ms<1 second



10s<36.7s>948.55ms*30



5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---