RF Test Report

Applicant	:	TEAM YOUNG TECHNOLOGY CO., LTD.
Product Type	:	Smart remote controller
Trade Name	:	EZCon
Model Number	:	TX-RC-1
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Receive Date	:	Oct. 04, 2019
Test Period	:	Oct. 24 ~ Nov. 04, 2019
Issue Date	:	Nov. 14, 2019

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 33465, Taiwan (R.O.C.)
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Taiwan Accreditation Foundation accreditation number: 1330
Test Firm MRA designation number: TW0010

Note:

1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
2.This report shall not be reproduced except in full, without the written approval of A Test Lab Technology Corporation.
3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Nov. 14, 2019	Initial Issue	Tobey Cheng

Verification of Compliance

Issued Date: Nov. 14, 2019

Applicant	:	TEAM YOUNG TECHNOLOGY CO., LTD.
Product Type	:	Smart remote controller
Trade Name	:	EZCon
Model Number	:	TX-RC-1
FCC ID	:	2AUVZ-TX-RC-1
EUT Rated Voltage	:	DC 3 V
Test Voltage	:	DC 3 V
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade District, Taoyuan City 33465, Taiwan (R.O.C.) Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330 http://www.atl-lab.com.tw/e-index.htm

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By : Fly Lu

(Manager) (Fly Lu)

TABLE OF CONTENTS

1 General Information

1.1. Summary of Test Result

Standard	Item	Results	Remark
15.207	AC Power Conducted Emission	N/A	This device use DC power source.
15.231(a)	Transmitter Deactivation Time	PASS	----
15.231(b)	Transmitter Radiated Emissions	PASS	----
15.231(c)	20 dB Bandwidth	PASS	----
15.203	Antenna Requirement	PASS	----
CFR 47 Part 15.231(2010) / ANSI C63.10:2013			

Standard	Description
CFR47, Part 15, Subpart C	Intentional Radiators
ANSI C63. 10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.2. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conducted Emission	150 kHz ~ 30 MHz	2.8
Radiated Emission	30 MHz ~ 1000 MHz	5.7
	1000 MHz ~ 18000 MHz	5.6
	18000 MHz ~ 26500 MHz	4.9
	26500 MHz ~ 40000 MHz	4.8
RF Bandwidth	4.96 %	

Decision Rule

■ Uncertainty is not included.

□ Uncertainty is included.

2 EUT Description

Applicant	TEAM YOUNG TECHNOLOGY CO., LTD. 18F-1, No.400, Huanbei Rd., Zhongli District, Taoyuan City 320, Taiwan
Manufacturer	Song Yi Technology Corporation No. 1, Ziqiang 6th Rd., Zhongli Dist., Taoyuan City 320, Taiwan (R.O.C.)
Product Type	Smart remote controller
Trade Name	EZCon
Model Number	TX-RC-1
FCC ID	2AUVZ-TX-RC-1
Frequency Range	433.92 MHz
Modulation Type	ASK
Number of Channels	1 Channel
Antenna Type	PCB Antenna
Antenna Max. Gain	1 dBi
Operate Temp. Range	0 ~ +40 ℃

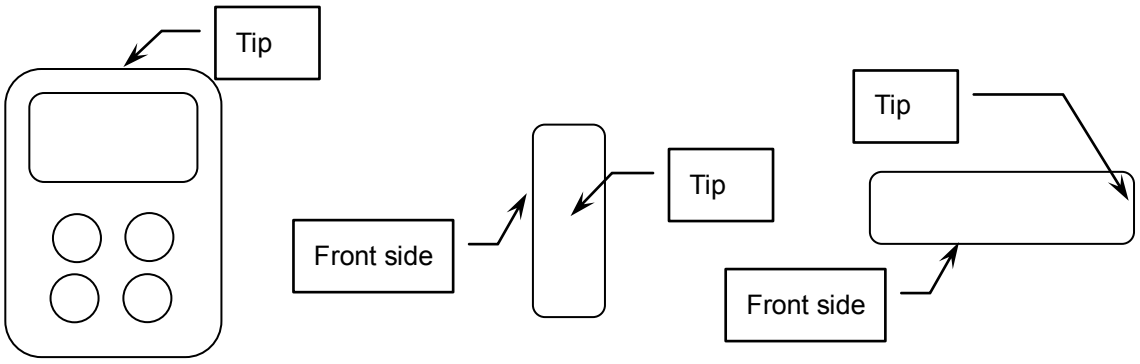
3 Test Methodology

3.1. Mode of Operation

Test Mode
Mode 1: Continuous TX Mode

Then, the above highest fundamental level mode of the configuration of the EUT and antenna was chosen for all final test items.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.



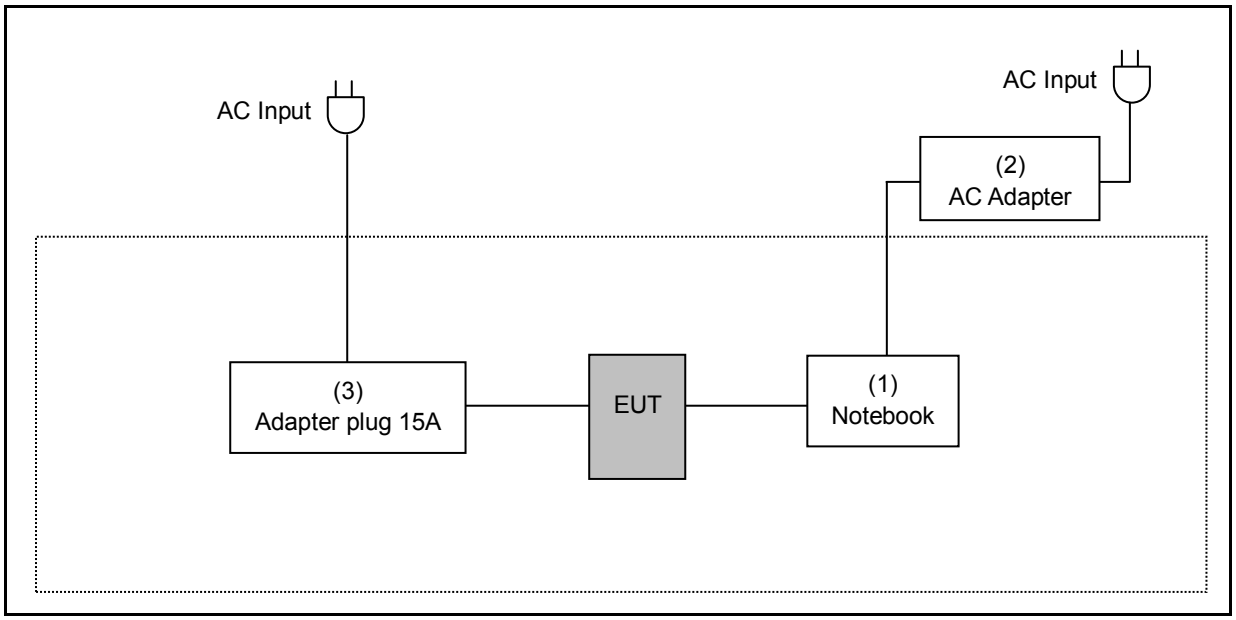
3.2. EUT Test Step

1.	Setup the EUT shown on “Configuration of Test System Details”.
2.	Turn on the power of all equipment.
3.	The EUT will start to operate function.

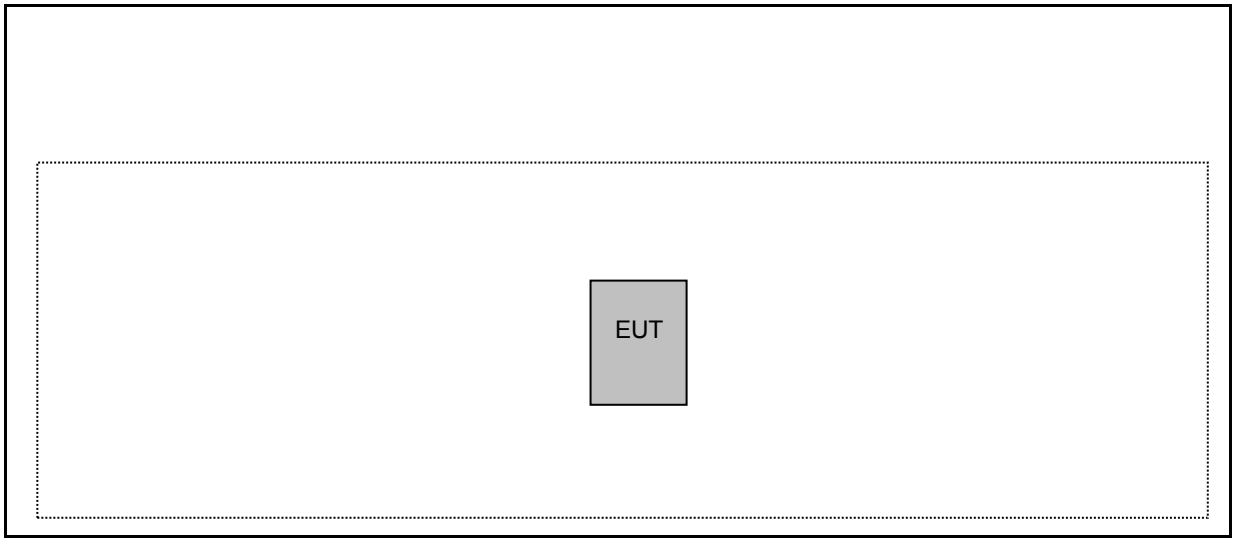
Measurement Software			
No.	Description	Software	Version
1	Radiated Emission	EZ EMC	1.1.4.4

3.3. Configuration of Test System Details

Below 1 GHz



Above 1 GHz



Devices Description					
Product		Manufacturer	Model Number	Serial Number	Power Cord
(1)	Notebook	ASUS	P2430U	GANXCV04H86940A	---
(2)	AC Adapter	ASUS	ADP-65GD B	---	Non-Shielded, 0.8 m
(3)	Adapter plug 15A	TEAM YOUNG	RX15-BTS-1	---	---

3.4. Test Instruments

For Radiated Emissions
Test Period: Nov. 04, 2019
Testing Engineer: Ricky Liu

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer (10 Hz~44 GHz)	Keysight	N9010A	MY52221312	01/14/2019	1 year
Pre Amplifier (1~26.5 GHz)	Agilent	8449B	3008A02237	10/18/2019	1 year
Pre Amplifier (100 kHz~1.3 GHz)	Agilent	8447D	2944A11119	01/14/2019	1 year
Broadband Antenna	Schwarzbeck	VULB9168	416	10/23/2019	1 year
Horn Antenna (1~18 GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	08/22/2019	1 year
RF Cable	EMCI	EMC104-N-N-6000	TE01-1	02/20/2019	1 year
Microwave Cable	EMCI	EMC104-SM -SM-13000	170814	10/30/2019	1 year
Microwave Cable	EMCI	EMC102-KM -KM-14000	151001	02/20/2019	1 year

For Conducted
Test Period: Oct. 24, 2019
Testing Engineer: Negi Chiu

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer (20 Hz~26.5 GHz)	Agilent	N9020A	US47520902	09/18/2019	1 year

3.5. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	23-26
Humidity (%RH)	25-75	55-60
Barometric pressure (mbar)	860-1060	990

4 Measurement Procedure

4.1. Radiated Emissions Measurement

■ Limit

According to FCC Part 15.231(b) requirement:

In addition to the provisions of §15.205, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

Fundamental and harmonics emission limits

Frequency range	Average Field Strength of Fundamental	Peak Field Strength of Fundamental
(MHz)	(dBμV/m@3 m)	(dBμV/m@3 m)
433.92	80.83	100.83

General Radiated emission Limit

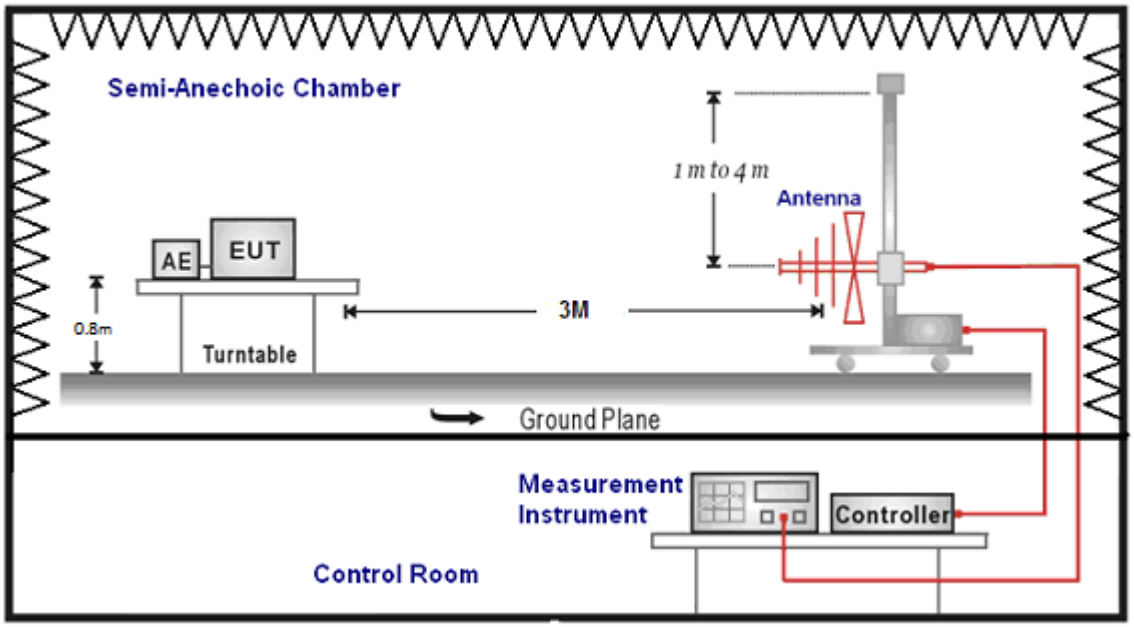
Frequency range	Field Strength of Fundamental	Field Strength of Harmonics
(MHz)	(uV/m at 3 m)	(uV/m at 3 m)
40.66 to 40.70	2250 (67.04 dBuV)	225 (47.04 dBuV)
70 to 130	1250 (61.94 dBuV)	125 (41.94 dBuV)
130 to 174	1250 (61.94 dBuV) to 3750 (71.48 dBuV)	125 (41.94 dBuV) to 375 (51.48 dBuV)
174 to 260	3750 (71.48 dBuV)	375 (51.48 dBuV)
260 to 470	3750 (71.48 dBuV) to 12500 (81.94 dBuV)	375 (51.48 dBuV) to 1250 (61.94 dBuV)
470 and above	12500 (81.94 dBuV)	1250 (61.94 dBuV)

Remark: 1. The table above tighter limit applies at the band edges.

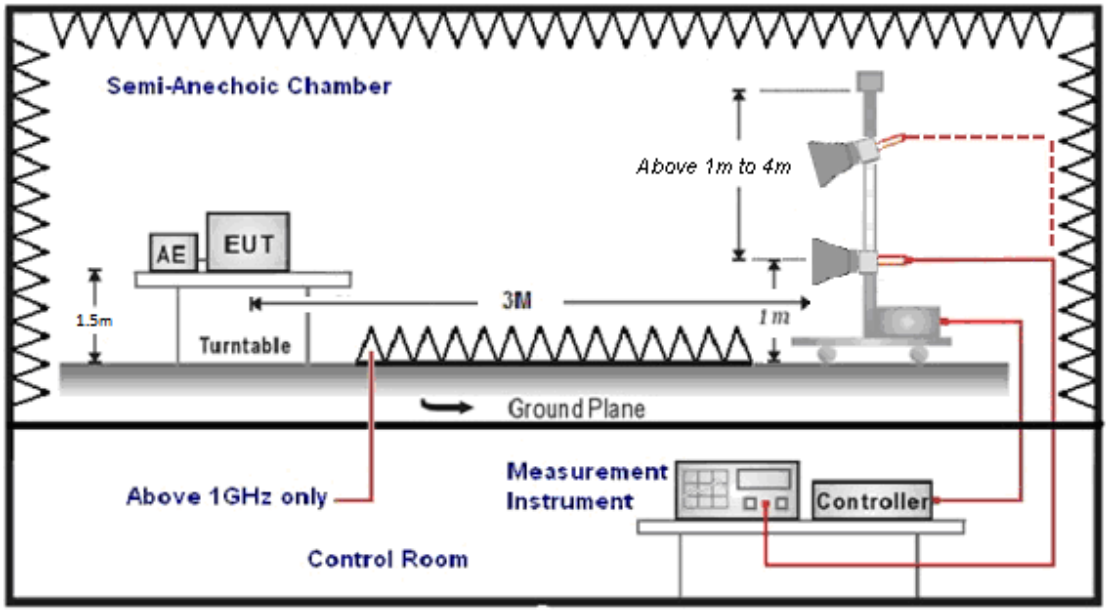
2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

■ **Setup**

Below 1 GHz



Above 1 GHz



■ Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 26.5 GHz is investigated.
For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 10 Hz for average measurements.
A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.
SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20 dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.
The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).
The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30 dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.

■ 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.
Please see the diagrams below.

(*) When the field strength (or envelope power) is not constant or when it is in pulses, and an averaging detector is specified to be used, the value of field strength or power over one complete pulse train, excluding blanking intervals, shall be averaged as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value (of field strength or output power) shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

4.2. 20 dB Bandwidth Measurement

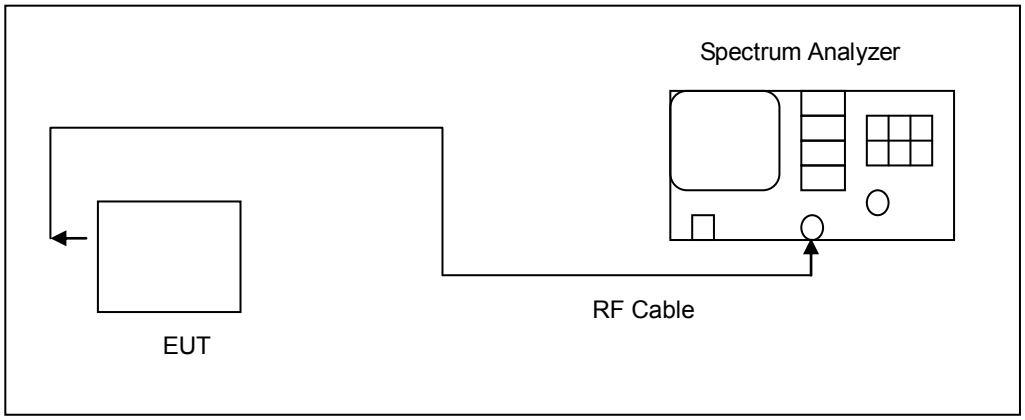
■ Limit

According to FCC Part 15.231(c) requirement:

The 20 dB bandwidth shall be no wider than 0.25 % of the centre frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5 % of the centre frequency.

B.W Limit = 0.25 % * f (MHz) = 0.25 % * 433.92 MHz = 1084.8 kHz

■ Test Setup



■ Test Procedure

20 dB Bandwidth

The RF output port of the Equipment-Under-Test is directly coupled to the input of the analyzer through a specialized RF connector and a 10 dB passive attenuator. A fully charged battery was used for the supply voltage. The RF function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = 1 MHz
2. RBW ≥ 1 % of the 20 dB span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20 dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20 dB bandwidth of the emission.

4.3. Antenna Requirement

- **Limit**

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.

- **Antenna Connector Construction**

See section 2 – antenna information.

5 Test Results

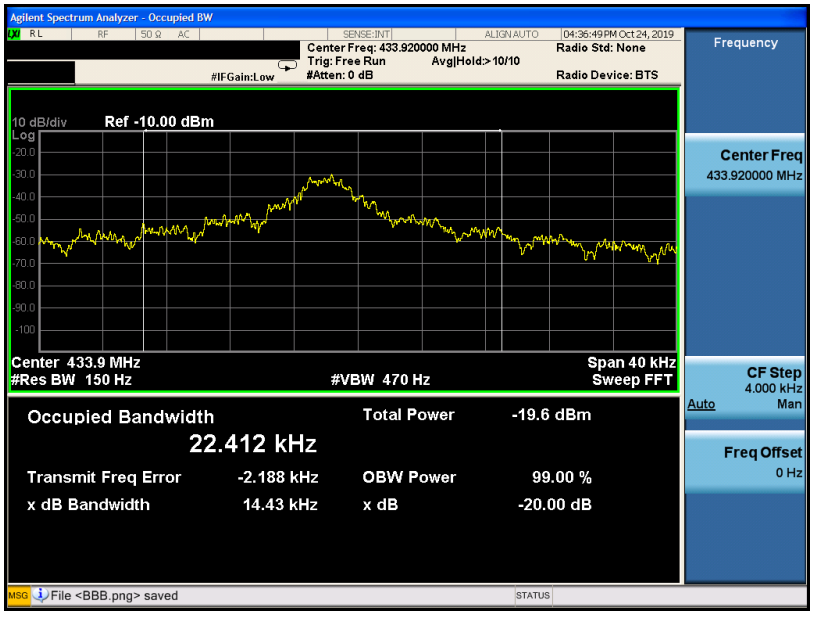
Annex A. Conducted Test Results

20 dB Bandwidth Measurement

Test Mode	Mode 1	
Frequency (MHz)	20 dB Bandwidth (kHz)	Limited (kHz)
433.92	14.43	1084.800

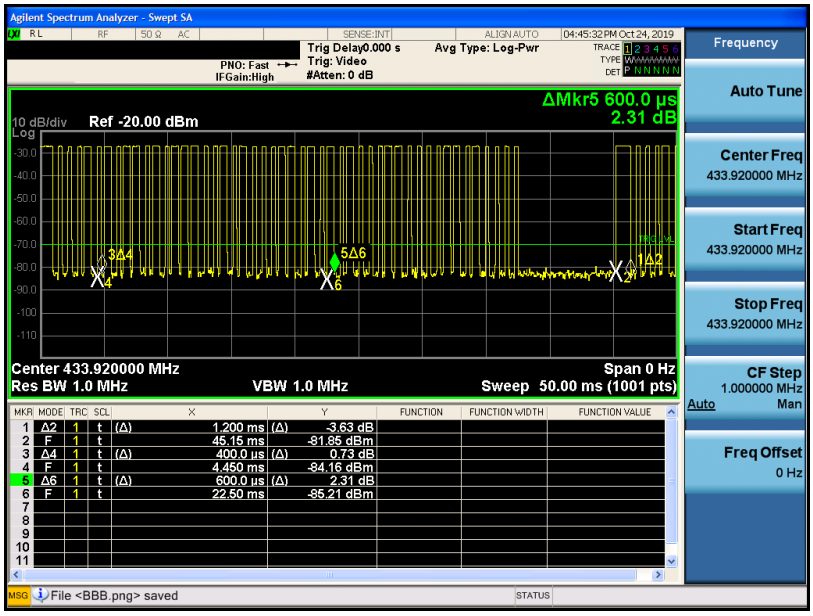
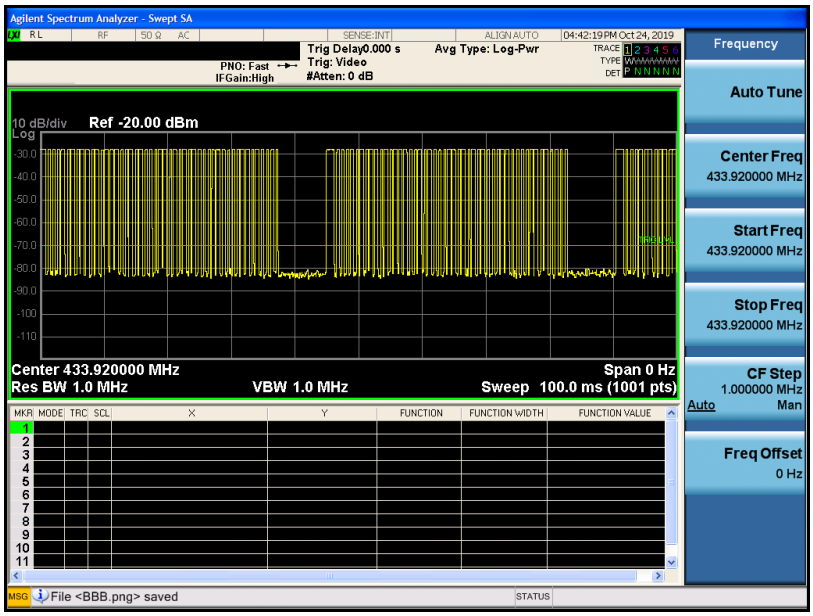
■ **Test Graphs**

Mode 1



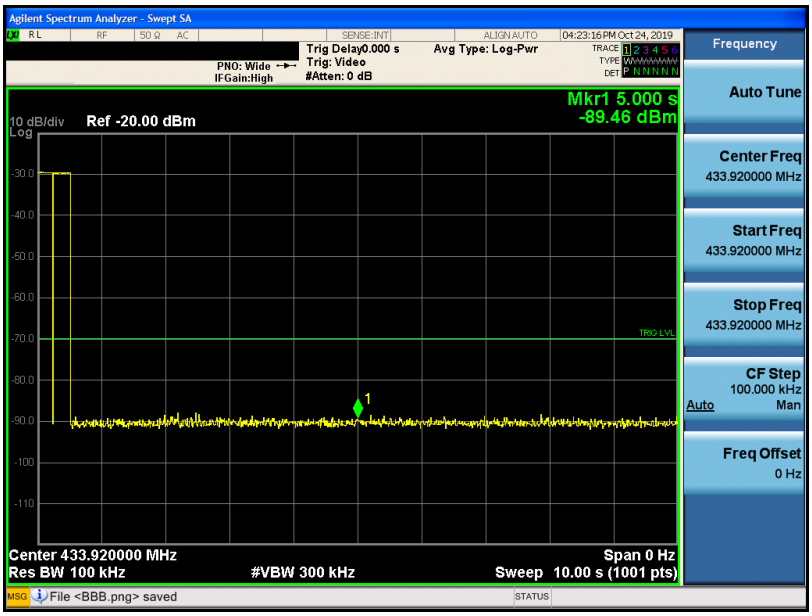
Annex B. Radiated Emissions Measurement

Duty Cycle Test Diagrams

Mode 1	
On time	
On+off time	

The EUT was complied with the requirement of FCC 15.231 (a) (1), which employed a switch that will automatically deactivate the transmitter within less than 5 seconds of being released.

Mode 1



Duty Cycle Results

Test Mode	Mode 1	
Item	Results	Note
Ton	53.40 ms	-----
Tp	100 ms	-----
Duty Cycle	0.53400	-----
Averaging Factor (20 log * Duty Cycle)	-5.449	-----

Please see the diagrams below.

Note:

1. RB=100 kHz, VB=300 kHz, SPAN=0
2. Duty Cycle= Ton/Tp

Fundamental Frequency Test Results

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Fundamental	Power:	DC 3 V
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH
Ant.Polar.:	Horizontal		
Description:			

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	433.9500	86.38	-1.38	85.00	100.83	-15.83	peak
2	433.9500	85.00	-5.45	79.55	80.83	-1.28	AVG

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

Example: 85.00 = -1.38 + 86.38

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Fundamental	Power:	DC 3 V
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH
Ant.Polar.:	Vertical		
Description:			

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	433.9600	74.21	-1.37	72.84	100.83	-27.99	peak
2	433.9600	72.84	-5.45	67.39	80.83	-13.44	AVG

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

Example: 72.84 = -1.37 + 74.21

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

Below 1 GHz

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Harmonic	Power:	DC 3 V
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
154.1600	27.91	-5.79	22.12	43.50	-21.38	QP	H
261.8300	33.69	-5.57	28.12	46.00	-17.88	QP	H
428.6700	28.45	-1.51	26.94	46.00	-19.06	QP	H
522.7600	32.98	0.15	33.13	46.00	-12.87	QP	H
669.2300	27.86	3.10	30.96	46.00	-15.04	QP	H
760.4100	28.67	5.04	33.71	46.00	-12.29	QP	H
159.9800	29.03	-5.70	23.33	43.50	-20.17	QP	V
254.0700	28.01	-5.95	22.06	46.00	-23.94	QP	V
357.8600	28.24	-2.97	25.27	46.00	-20.73	QP	V
488.8100	28.69	-0.47	28.22	46.00	-17.78	QP	V
588.7200	29.52	1.94	31.46	46.00	-14.54	QP	V
777.8700	28.65	5.33	33.98	46.00	-12.02	QP	V

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

Example: 22.12 = -5.79 + 27.91

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

Above 1 GHz

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Harmonic	Power:	DC 3 V
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
1301.760	56.10	-5.48	50.62	74.00	-23.38	peak	H
1735.680	57.06	-3.57	53.49	74.00	-20.51	peak	H
1735.680	51.61	-3.57	48.04	54.00	-5.96	AVG	H
2169.600	54.10	-1.94	52.16	74.00	-21.84	peak	H
2169.600	48.65	-1.94	46.71	54.00	-7.29	AVG	H
2603.520	49.41	-0.07	49.34	74.00	-24.66	peak	H
3037.440	49.70	1.43	51.13	74.00	-22.87	peak	H
3471.360	51.06	2.25	53.31	74.00	-20.69	peak	H
3471.360	45.61	2.25	47.86	54.00	-6.14	AVG	H
3905.280	50.34	3.68	54.02	74.00	-19.98	peak	H
3905.280	44.89	3.68	48.57	54.00	-5.43	AVG	H
4339.200	52.79	4.91	57.70	74.00	-16.30	peak	H
4339.200	47.34	4.91	52.25	54.00	-1.75	AVG	H

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

Example: 50.62 = -5.48 + 56.10

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

Standard:	FCC Part 15.231	Test Distance:	3 m
Test item:	Harmonic	Power:	DC 3 V
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60 %RH

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
1301.760	56.44	-5.48	50.96	74.00	-23.04	peak	V
1735.680	50.12	-3.57	46.55	74.00	-27.45	peak	V
2169.600	51.91	-1.94	49.97	74.00	-24.03	peak	V
2603.520	47.52	-0.07	47.45	74.00	-26.55	peak	V
3037.440	45.72	1.43	47.15	74.00	-26.85	peak	V
3471.360	47.13	2.25	49.38	74.00	-24.62	peak	V
3905.280	46.42	3.68	50.10	74.00	-23.90	peak	V
4339.200	49.95	4.91	54.86	74.00	-19.14	peak	V
4339.200	44.50	4.91	49.41	54.00	-4.59	AVG	V

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

Example: 50.96 = -5.48 + 56.44

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.When the peak results are less than average limit, so not need to evaluate the average.

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