EUROFINS ELECTRICAL TESTING SERVICE (SHENZHEN) CO., LTD.

RADIO TEST - REPORT

FCC Compliance Test Report for

Product name: RF Remote control

Model name: TMG_RMT_01

FCC ID: 2AZQMPCL

Test Report Number: EFGX21040274-IE-01-E02

The above sample(s) and sample information was/were submitted and identified on behalf of the applicant.
Eurofins assures objectivity and impartiality of the test, and fulfills the obligation of confidentiality for applicant's commercial information and technical documents.

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Content

1 General Information

1.1 Notes

The results of this test report relate exclusively to the item tested as specified in chapter “Description of test item” and are not transferable to any other test items.

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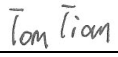
Operator:

Date	Eurofins-Lab.	Name / Title	Signature
2021-07-16		Bruce Zheng / Project Engineer	

Technical responsibility for area of testing:

Date	Eurofins-Lab.	Name / Title	Signature
2021-07-16		Tom Tian / Supervisor	

1.2 Testing laboratory

Eurofins Electrical Testing Service (Shenzhen) Co., Ltd.
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Telephone : +86-755-82911867
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The Laboratory has passed the Accreditation by the American Association for Laboratory Accrediation (A2LA). The Accreditation number is 5376.01
The Laboratory has been listed by industry Canada to perform electromagnetic emission measurements, The CAB identifier is CN0088

1.3 Details of applicant

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Telephone	:	+1 (425) 223-6137
Fax	:	+1 (707) 902-3694

1.4 Details of Manufacturer

Name	:	DongGuan MingYan Electronic Technology Co. Ltd.
Address	:	No. 3, Lane 6, Xintang Tangwei Street, Dalingshan Town, Dongguan City, Guangdong Province, China
Telephone	:	+86 15322444237
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1.5 Application details

Date of receipt of application	:	2021-04-27
Date of receipt of test item	:	2021-04-27
Date of test	:	2021-04-27 to 2021-06-27
Date of issue	:	2021-07-16

1.6 Test item

Product type	:	RF Remote control
Model name	:	TMG_RMT_01
Brand	:	./.
Serial number	:	./.
Ratings	:	DC 3V(by CR2025 battery)
Test voltage	:	DC 3V
FCC ID	:	2AZQMPCL
Additional information	:	./.

RadioTechnical data

Frequency range	:	433.92MHz
Radio Tech.	:	N/A
Frequency channel	:	1 Channel
Modulation	:	ASK
Antenna type	:	PCB antenna
Antenna gain	:	0dBi

1.7 Test standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

Test Method

1: ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
2: ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices.

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed. ☒

or

The deviations as specified were ascertained in the course of the tests performed. ☐

2.2 Test environment

Ac line conducted

Enviroment Parameter	Temperature	Relative Humidity
--	--	--

RF conducted

Enviroment Parameter	Temperature℃	Relative Humidity
101.4kPa	25.9	68.3%

Radiated

Enviroment Parameter	Temperature℃	Relative Humidity
101.4kPa	21.34	61.2%

2.3 Measurement uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

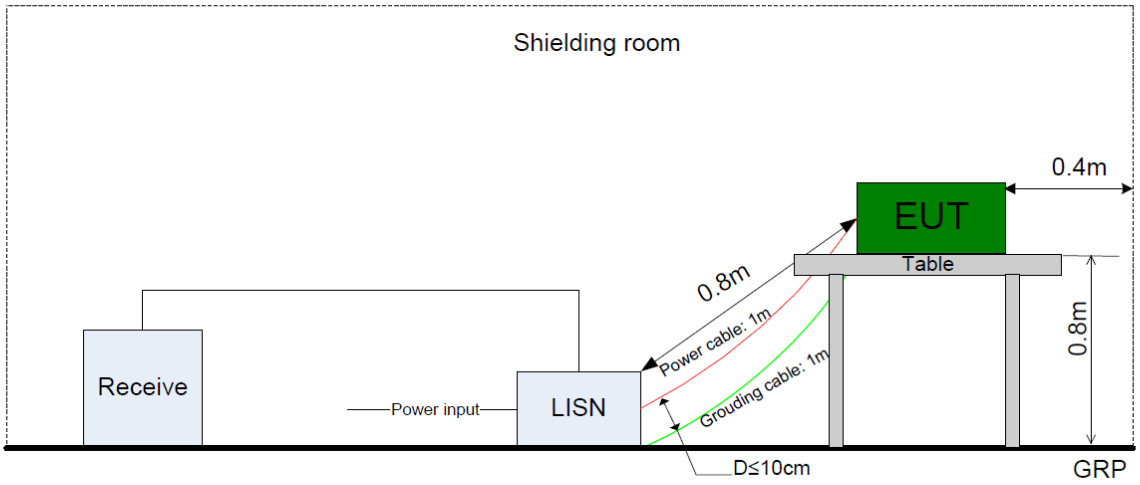
System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted RF test	RF Power Conducted: 1.16dB Frequency test involved: 1.05×10-7 or 1%
Uncertainty for Radiated Spurious Emission 25MHz-1000MHz	Horizontal: 4.46dB; Vertical: 4.54dB;
Uncertainty for Radiated Spurious Emission 1000Mz-18000MHz	Horizontal: 4.42dB; Vertical: 4.41dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.63dB; Vertical: 4.62dB;

2.4 Test equipment utilized

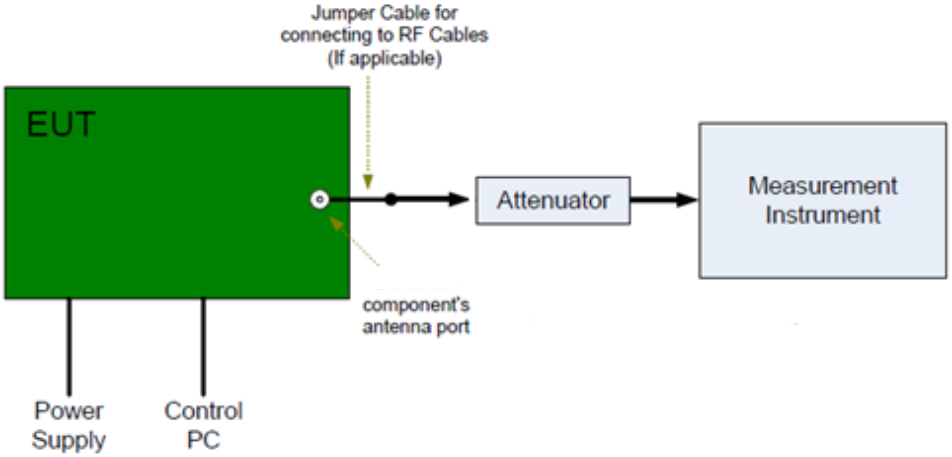
EQUIPMENT ID	EQUIPMENT NAME	MODEL NO.	CAL. DUE DATE
23-2-13-05	EMI Test Receiver	ESR3	2022-03-15
23-2-13-06	LISN	NNLK 8127 RC	2022-03-15
23-2-10-16	Attenuator	VTSD 9561-F	2022-03-16
23-2-10-63	Temperature & Humidity Meter	COS-03	2022-03-27
23-2-10-65	Barometer	Baro	2022-03-23
23-2-13-12	Signal Analyzer	N9010B-544	2022-03-15
23-2-13-13	BT/WLAN Tester	CMW270	2022-03-15
23-2-13-14	Signal Generator	N5183B-520	2022-03-15
23-2-13-15	Vector Signal Generator	N5182B-506	2022-03-15
23-2-10-43	Switch and Control Unit	ERIT-E-JS0806-2	2022-06-17
23-2-10-44	DC power supply	E3642A	2022-06-03
23-2-10-45	Temperature test chamber	SG-80-CC-2	2022-03-15
23-2-10-50	Temperature & Humidity Meter	COS-03	2022-03-27
23-2-10-66	Barometer	Baro	2022-03-23
23-2-13-01	EMI Test Receiver	ESR7	2022-03-15
23-2-13-02	Signal Analyzer	N9020B-544	2022-03-15
23-2-12-01	Active Loop Antenna	FMZB 1519B	2022-05-13
23-2-12-02	TRILOG Broadband Antenna	VULB9168	2022-04-27
23-2-12-03	Horn Antenna	3117	2022-05-11
23-2-12-04	Horn Antenna	BBHA 9170	2022-05-11
23-2-10-01	Preamplifier	BBV9745	2022-03-16
23-2-10-02	Preamplifier	TAP01018048	2022-03-16
23-2-10-03	Preamplifier	TAP18040048	2022-03-22
23-2-10-62	Temperature & Humidity Meter	COS-03	2022-03-27
23-2-10-64	Barometer	Baro	2022-03-23
23-2-10-14	Switch and Control Unit	ERIT-E-JS0806-SF1	N/A
23-2-13-03	EMI Test Receiver	ESR7	2022-03-16
23-2-13-04	Signal Analyzer	N9020B-526	2022-03-15
23-2-12-06	Active Loop Antenna	FMZB 1519B	2022-05-13
23-2-12-07	TRILOG Broadband Antenna	VULB9168	2022-04-27
23-2-12-08	Horn Antenna	3117	2022-05-11
23-2-10-46	Preamplifier	BBV9745	2022-03-16
23-2-10-47	Preamplifier	TAP01018048	2022-03-16
23-2-10-61	Temperature & Humidity Meter	COS-03	2022-03-27
23-2-10-52	Barometer	Baro	2022-03-23
23-2-10-15	Switch and Control Unit	ERIT-E-JS0806-SF1	N/A

2.5 Setup

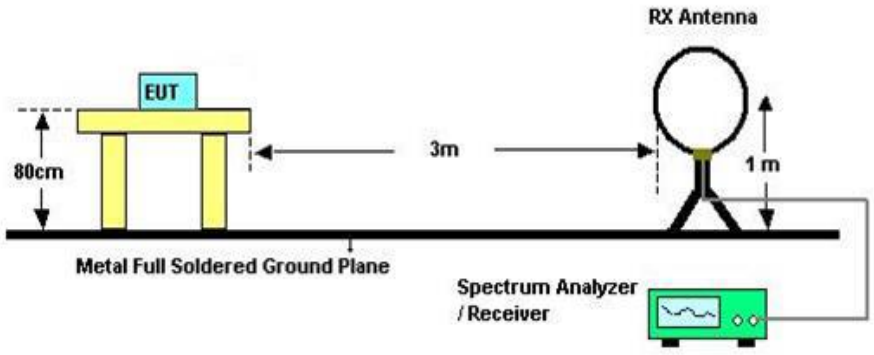
Ac line conducted



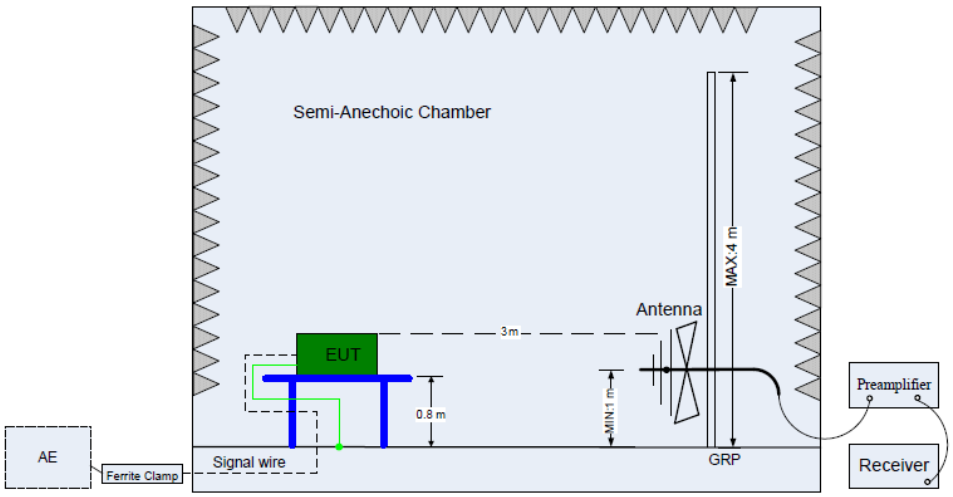
RF conducted tests



Radiated tests below 30MHz

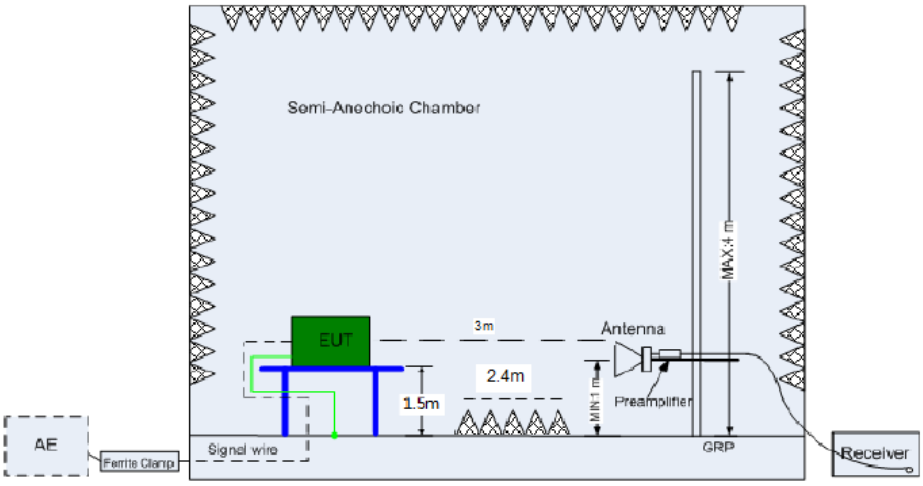


Radiated tests below 1GHz



(Below 1 GHz)

Radiated tests above 1GHz



(Above 1 GHz)

2.6 Test results

☒ 1st test ☐ test after modification ☐ production test

Technical Requirements				
FCC Part 15 Subpart C				
Test Condition		Test Result	Verdict	Test Site
§15.207	Conducted emission AC power port	--	N/A	--
§15.231(a)(1)	Automatically Deativate	Page 12	Pass	Site 1
§15.231(c)	20dB Bandwidth	Page 13	Pass	Site 1
§15.231(b)(3) §15.209 §15.205	Field strength of fundamental & Field strength of spurious emission	Page 18	Pass	Site 1
§15.203	Antenna requirement	See note 1	Pass	--

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses a PCB antenna, the gain: 0dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.
Note 2: The EUT has twelve button with same duty cycle and it was setted to continue transimitting by debug software, therefore we pressed one button to transmitting 433.92MHz Fundamental frequency during Testing.

3 Technical Requirement

3.1 Conducted emission AC power port

Test Method:
The test method was refered to the subclause 6.2 of ANSI C63.10-2013.

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both Neutral and Live lines.

Limit:

FCC §15.207 (a)

Frequency	QP Limit	AV Limit
MHz	dBµV	dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linear.

Test Result:

Not Applicable, the EUT was supplied by 3Vdc from CR2032 battery.

3.2 Automatically Deativate

Test Method:
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.

Limit:

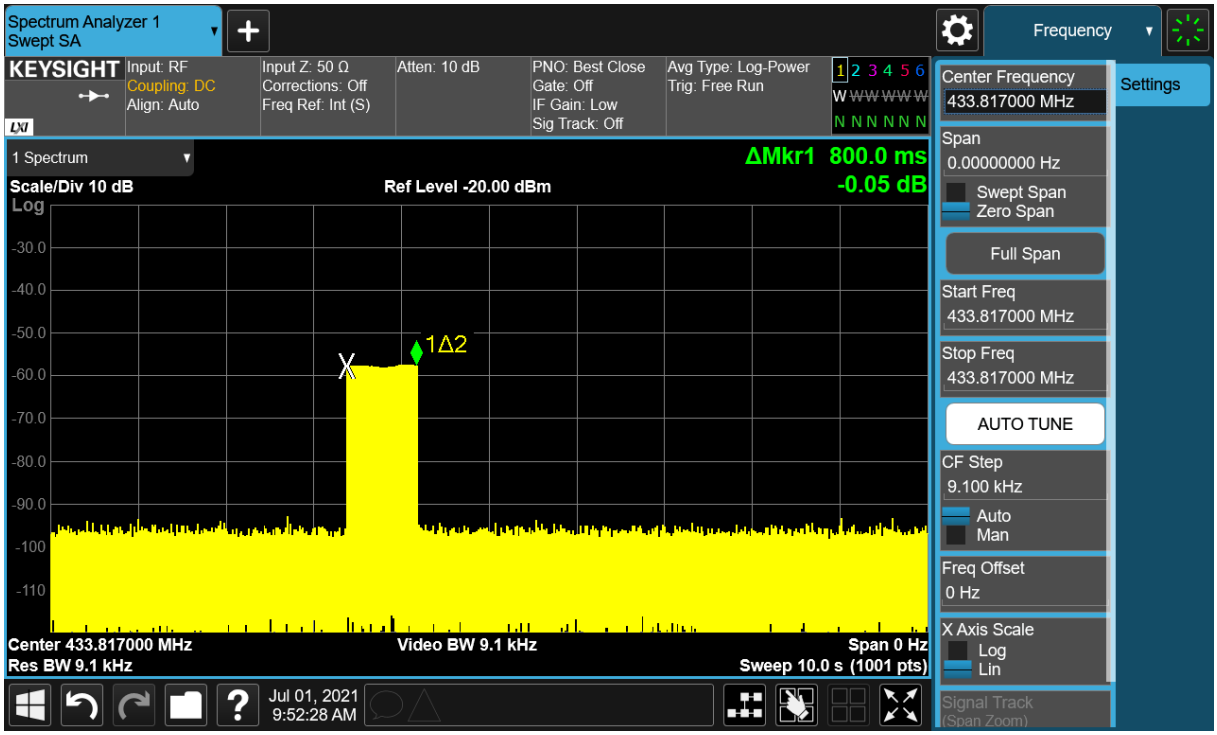
FCC § 15.231 (a)

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

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Test Result:

Time of Transmitting (ms)	Limit (sec)	Result
800	5	Pass



3.3 20dB bandwidth

Test Method:
The spectrum analyzer was receiving the maximum emission level. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

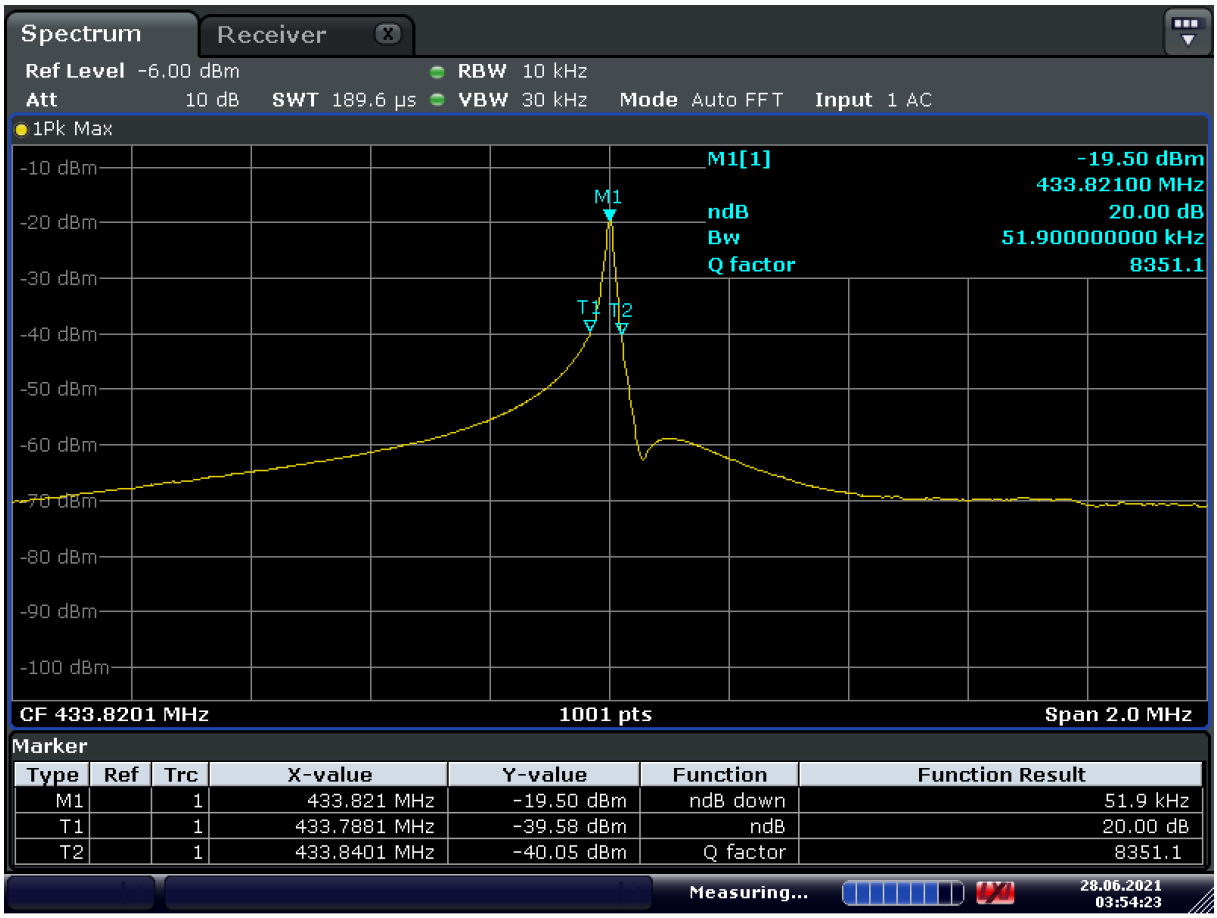
Limit:

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. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Result

20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (KHz)	Result
51.9	N/A	1084.80	Pass



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3.4 Field strength of fundamental and Field strength of spurious emission for transmitter

Test Method:

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

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

3: The height of antenna 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.

4: 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.

5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 30MHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 200 Hz, VBW⩾RBW from 9KHz to 0.15MHz, RBW 9KHz VBW⩾RBW from 0.15MHz to 30MHz for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

Limit:
FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

§15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	
13.36-13.41			

§15.231 (b)

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] 1,250

[1] Linear interpolations.

Field Strength of the Fundamental Emissions
The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit.
Fundamental Quasi-peak/Average:
=20*LOG(((433.92-260)*(12500-3750))/(470-260)+3750) ≈ 80.83dBuV/m

Fundamental Peak:
= 80.83dBuV/m + 20 = 100.83dBuV/m

Remark:
Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

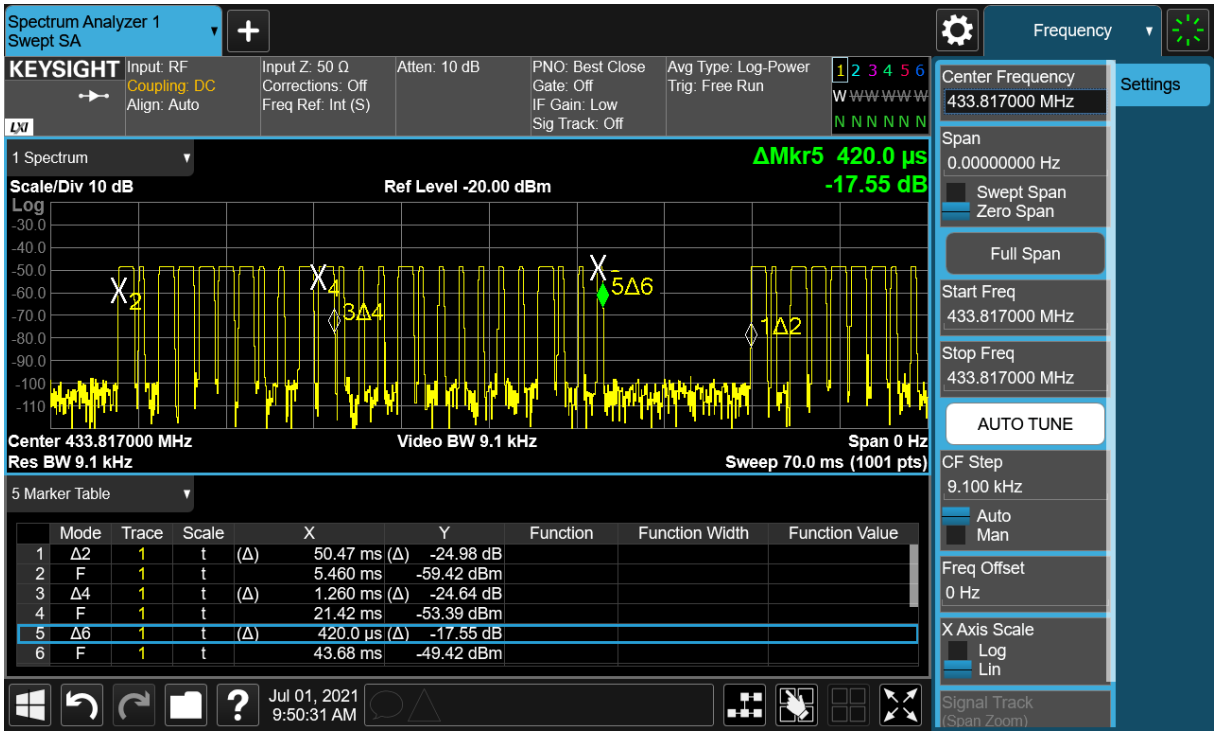
Result of PK=Reading Level +Antenna Factor + Cable Loss - Amplifier Gain.

Result of AV= Reading Level +Antenna Factor + Cable Loss - Amplifier Gain+Duty factor.

According to C63.10, if the peak (or quasi-peak) measured value complies with the aver-age limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Note: The low frequency, which started from 9 kHz to 30MHz with X/Y/Z axis, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

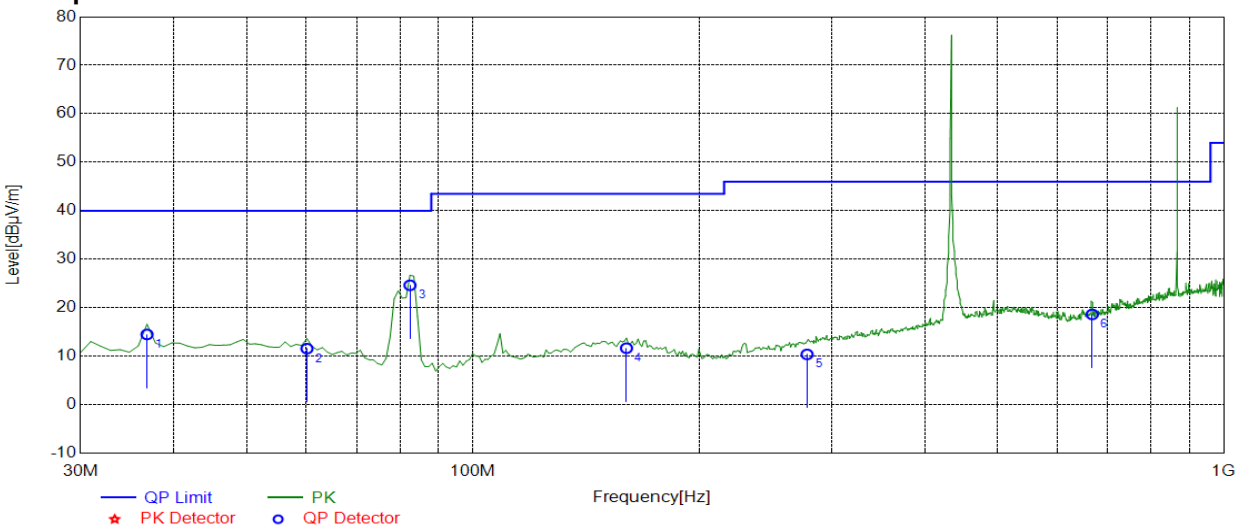
The duration of one cycle = 50.47ms
Effective period of the cycle=(1.26×10+0.42×14)ms=18.48ms
DC = 18.48ms÷50.47ms≈0.366 or 36.6%
Therefore, the av factor is found by 20×log10(0.366)≈ -8.73dB



Below 1GHz

Mode:	433.92 Tx	Voltage:	DC 3V

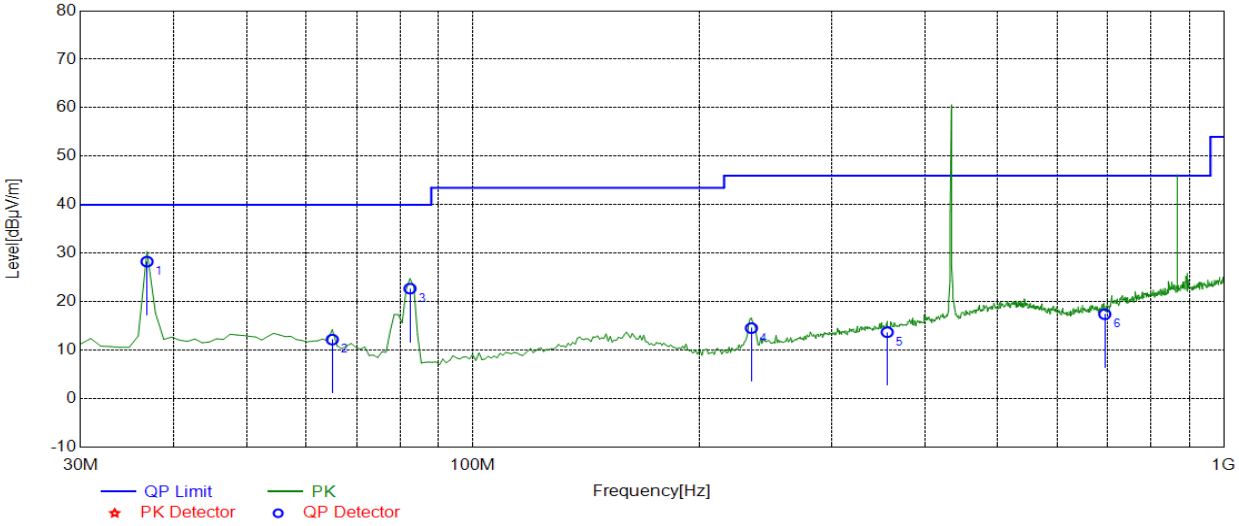
Test Graph



QP Final Data List							
NO.	Freq. [MHz]	Factor [dB/m]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity	Verdict
1	36.7968	-16.35	14.50	40.00	25.50	Horizontal	PASS
2	60.1001	-16.27	11.57	40.00	28.43	Horizontal	PASS
3	82.4324	-20.79	24.63	40.00	15.37	Horizontal	PASS
4	160.1101	-15.60	11.66	43.50	31.84	Horizontal	PASS
5	278.5686	-16.15	10.38	46.00	35.62	Horizontal	PASS
6	667.9279	-8.71	18.63	46.00	27.37	Horizontal	PASS

Mode:	433.92 Tx	Voltage:	DC 3V

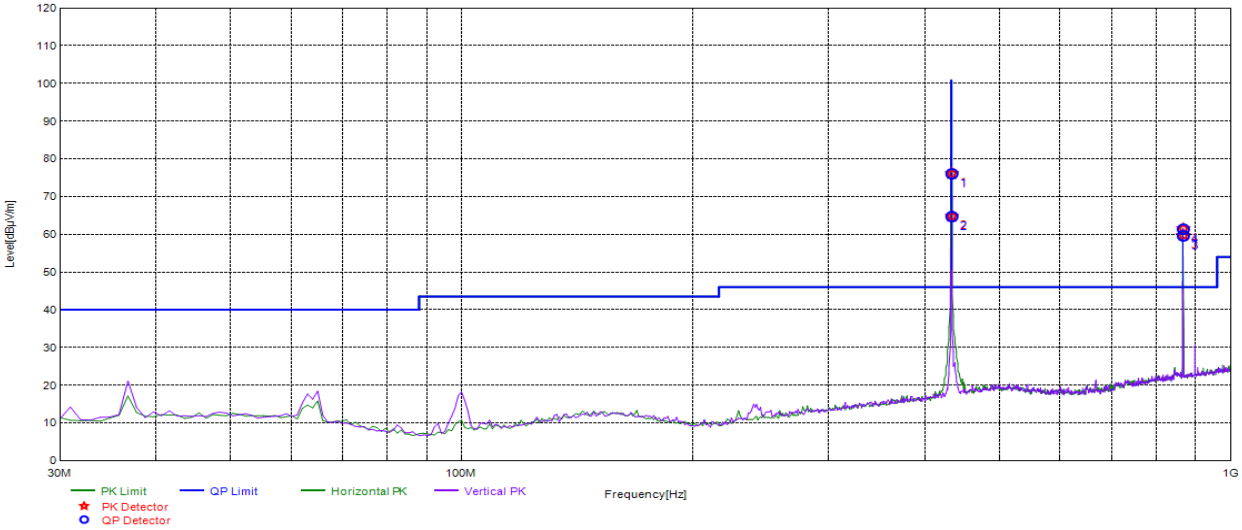
Test Graph



QP Final Data List							
NO.	Freq. [MHz]	Factor [dB/m]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity	Verdict
1	36.7968	-16.35	28.27	40.00	11.73	Vertical	PASS
2	64.9550	-17.23	12.19	40.00	27.81	Vertical	PASS
3	82.4324	-20.79	22.71	40.00	17.29	Vertical	PASS
4	234.8749	-17.92	14.56	46.00	31.44	Vertical	PASS
5	356.2462	-14.48	13.72	46.00	32.28	Vertical	PASS
6	694.1441	-8.45	17.43	46.00	28.57	Vertical	PASS

Mode:	433.92 Tx	Voltage:	DC 3V

Test Graph



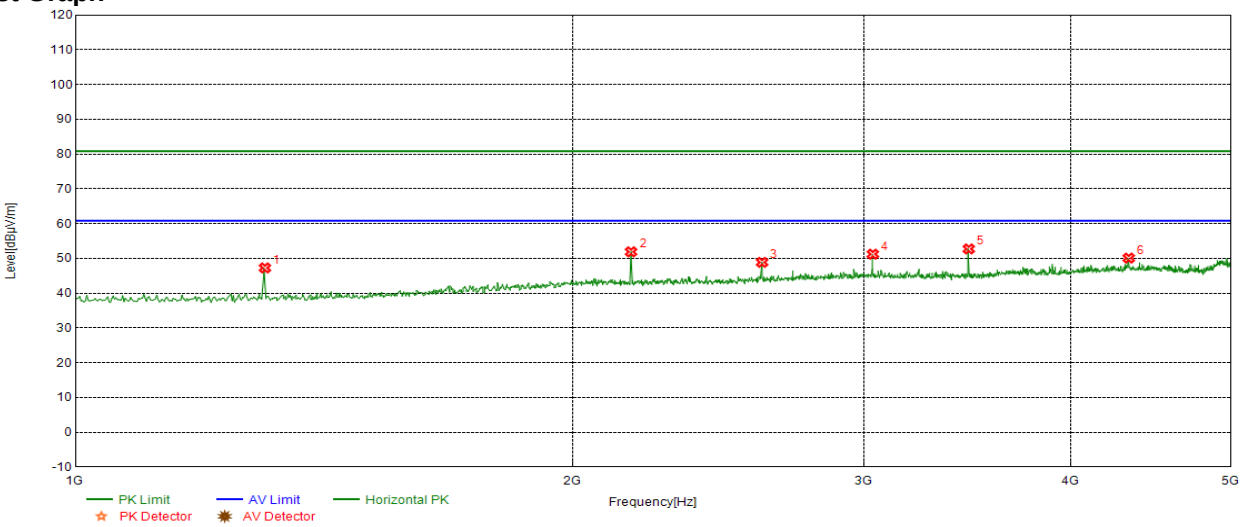
PK Final Data List							
NO.	Freq. [MHz]	Factor [dB/m]	PK Value [dBµV/m]	PK Limit [dBµV/m]	PK Margin [dB]	Polarity	Verdict
1	433.8229	-12.85	76.12	100.82	24.70	Horizontal	PASS
2	433.8229	-12.85	64.79	100.82	36.03	Vertical	PASS
3	867.6439	-5.93	59.76	80.82	21.06	Horizontal	PASS
4	867.6439	-5.93	61.5	80.82	19.32	Vertical	PASS

AV Final Data List								
NO.	Freq. [MHz]	Factor [dB/m]	AV Factor	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Polarity	Verdict
1	433.8229	-12.85	-8.73	67.39	80.82	13.43	Horizontal	PASS
2	433.8229	-12.85	-8.73	56.06	80.82	24.76	Vertical	PASS
3	867.6439	-5.93	-8.73	51.03	60.82	9.79	Horizontal	PASS
4	867.6439	-5.93	-8.73	52.77	60.82	8.05	Vertical	PASS

Above 1GHz

Mode:	433 Tx	Voltage:	DC 3V

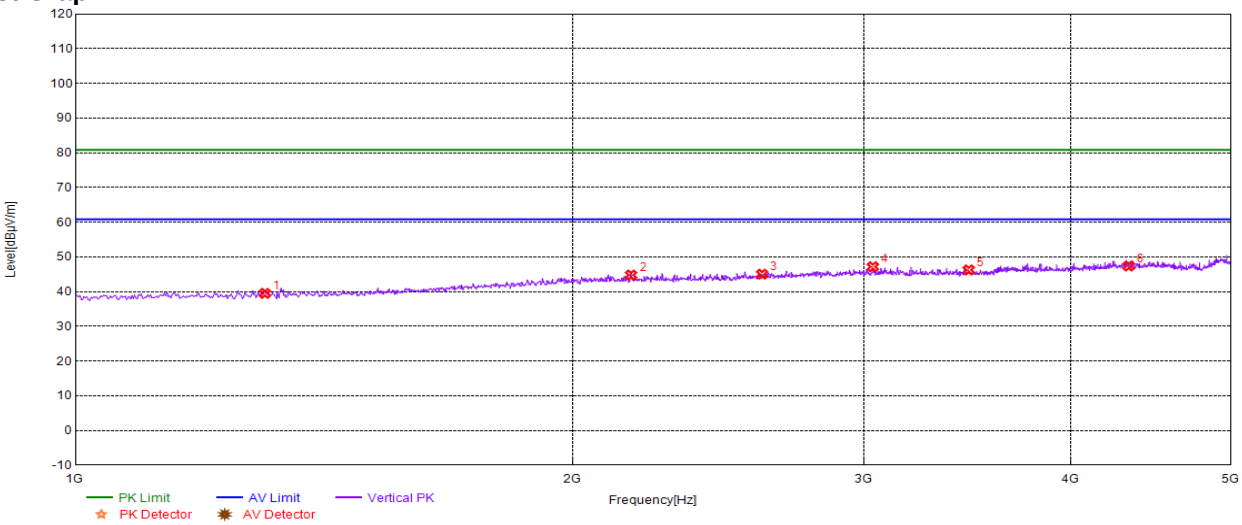
Test Graph



PK Final Data List								
NO.	Freq. [MHz]	PK Reading [dBµV/m]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Verdict
1	1302.15	73.75	47.28	-26.47	80.82	33.54	Horizon-	PASS
2	2168.58	73.30	51.91	-21.39	80.82	28.91	Horizon-	PASS
3	2602.80	69.30	48.88	-20.42	80.82	31.94	Horizon-	PASS
4	3037.01	70.27	51.23	-19.04	80.82	29.59	Horizon-	PASS
5	3471.23	71.52	52.74	-18.78	80.82	28.08	Horizon-	PASS
6	4337.66	66.37	50.10	-16.27	80.82	30.72	Horizon-	PASS

Mode:	433 Tx	Voltage:	DC 3V

Test Graph



PK Final Data List								
NO.	Freq. [MHz]	PK Reading [dBµV/m]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Polarity	Verdict
1	1302.15	65.97	39.51	-26.46	80.82	41.31	Vertical	PASS
2	2168.58	66.17	44.79	-21.38	80.82	36.03	Vertical	PASS
3	2602.80	65.47	45.05	-20.42	80.82	35.77	Vertical	PASS
4	3037.01	66.23	47.19	-19.04	80.82	33.63	Vertical	PASS
5	3471.23	65.04	46.26	-18.78	80.82	34.56	Vertical	PASS
6	4337.66	63.66	47.39	-16.27	80.82	33.43	Vertical	PASS

4 Test Setup Photos

Ref “EFGX21040274-IE-01-E02_Setup_Photos.pdf”

5 External Photo

Ref “EFGX21040274-IE-01-E02_External_Photos.pdf”

6 Internal Photos

Ref “EFGX21040274-IE-01-E02_Internal_Photos.pdf”

-End of report-