



MEASUREMENT REPORT

FCC PART 15.231(a) / RSS-210 Issue 9 – Annex A

FCC ID: 2APP3RF433M
IC: 23874-RF433M
APPLICANT: Meko Lighting Company Limited

Application Type: Certification
Product: LED Strip Light Remote Control
Model No.: RF 433M
FCC Classification: FCC Part 15 Security/Remote Control Transmitter (DSC)
FCC Rule Part(s): Part 15.231(a)
IC Rule(s): RSS-210 Issue 9 – Annex A
Test Procedure(s): ANSI C63.10-2013
Test Date: May 02 ~ June 01, 2018

Reviewed By : Kevin Guo
(Kevin Guo)
Approved By : Marlin Chen
(Marlin Chen)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1804RSU022-U1	Rev. 01	Initial report	06-01-2018	Valid

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§2.1033 General Information

Applicant:	Meko Lighting Company Limited
Applicant Address:	No.2, Songlin East Road, Zeng Tian Village, Xin An District, Chang An Town, Dongguan City, Guangdong Province, 523883, China
Manufacturer:	MEKO LIGHTING COMPANY LIMITED
Manufacturer Address:	No.2, Songlin East Road, Zeng Tian Village, Xin An District, Chang An Town, Dongguan City, Guangdong Province, 523883, China
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	893164
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	LED Strip Light Remote Control
Model No.	RF 433M
Frequency Range	433.92 MHz
Type of modulation	ASK
Antenna Type	Integral Antenna
Antenna Gain	0 dBi
Device Category	Portable Device

2.2. Test Standards

The following report is prepared on behalf of the device in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commission rules, and RSS-210 Issue 9 & RSS-Gen Issue 4 rules of IC rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commission rules, and RSS-210 Issue 9 & RSS-Gen Issue 4 rules of IC rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

2.3. Test Methodology

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013).

Deviation from measurement procedure.....None

2.4. EUT Setup and Test Mode

The EUT was operated at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode		
Test Mode	Description	Remark
Mode 1	Transmitting	With modulation

3. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antenna of the device is permanently attached.
- There are no provisions for connection to an external antenna.

Conclusion:

The device unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATA

Radiated Disturbance – AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2018/08/18
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2018/11/20
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2018/10/21
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2018/11/18
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2018/12/14
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2018/11/17
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2018/06/14
Temperature/Humidity Meter	Testo	608-H1	MRTSUE06404	1 year	2018/08/14
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2019/04/30

20dB Bandwidth – AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2018/08/18
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2018/10/21
Temperature/Humidity Meter	Testo	608-H1	MRTSUE06404	1 year	2018/08/14
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2019/04/30

Release Time – AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2018/08/18
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2018/10/21
Temperature/Humidity Meter	Testo	608-H1	MRTSUE06404	1 year	2018/08/14
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2019/04/30

Duty Cycle – AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2018/08/18
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2018/10/21
Temperature/Humidity Meter	Testo	608-H1	MRTSUE06404	1 year	2018/08/14
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2019/04/30

Software	Version	Function
e3	V8.3.5	EMI Test Software

5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT 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 $k = 2$.

Radiated Emission Measurement – AC2
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 18GHz: 4.76dB
Release Time Measurement – AC2
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 0.09ms

6. TEST RESULT

6.1. Summary

Company Name: **MEKO LIGHTING COMPANY LIMITED**

FCC ID: **2APP3RF433M**

IC: **23874-RF433M**

FCC Part Section(s)	IC Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.205 15.231(b)	RSS-210, A1.2	Radiated Emissions	Refer to 6.2.1	Radiated	Pass	Section 6.2
15.231(c)	RSS-210, A1.3	20dB Bandwidth	Refer to 6.3.1		Pass	Section 6.3
15.231(a)(1)	RSS-210, A1.1(a)	Release Time	Refer to 6.4.1		Pass	Section 6.4
15.231(b)	RSS-Gen, 6.10	Duty Cycle	Refer to 6.5.1		Pass	Section 6.5

Notes:

- 1) The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer.

6.2. Radiated Emissions

6.2.1. Standard Applicable

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2250	225
70 - 130	1250	125
130 - 174	¹ 1250 to 3750	¹ 125 to 375
174 - 260	3750	375
260 - 470	¹ 3750 to 12500	¹ 375 to 1250
Above 470	12500	1250

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements start below or at the lowest crystal frequency.

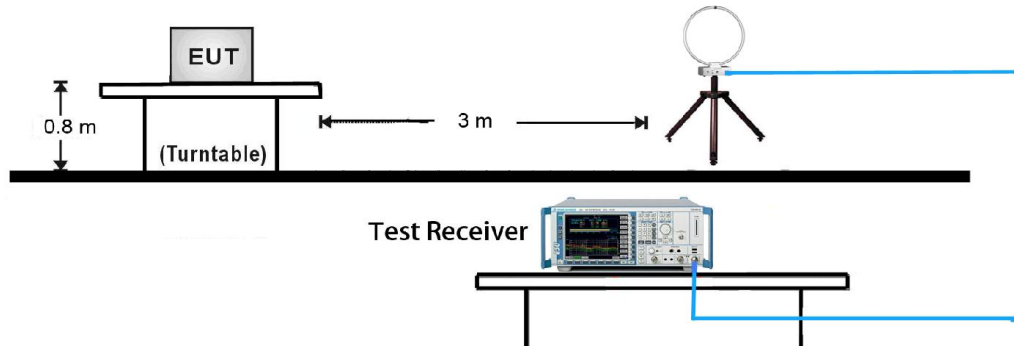
Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

6.2.2. Test Procedure

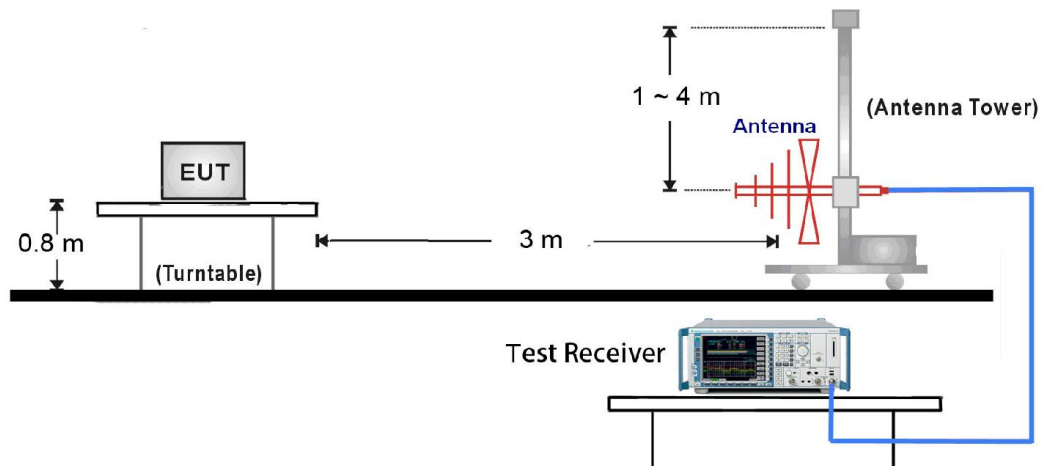
The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.231(b) and FCC Part 15.209 Limit.

6.2.3. Test Setup

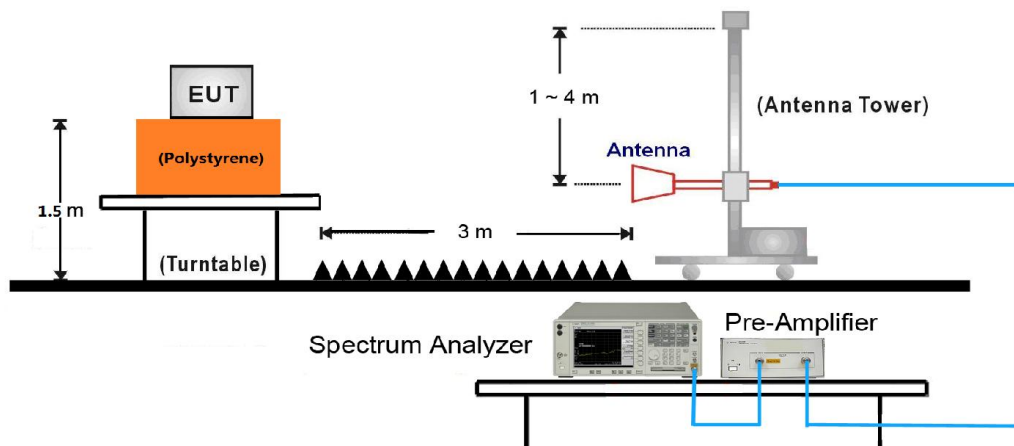
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:

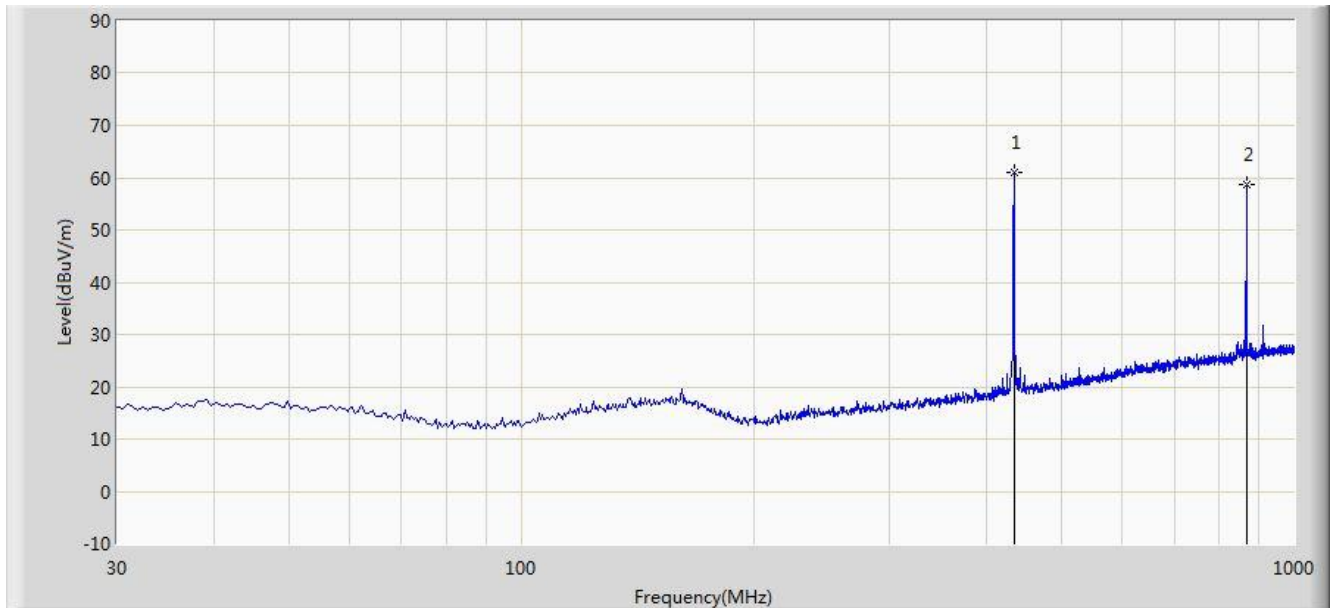


1GHz ~ 6GHz Test Setup:



6.2.4. Test Results

Site: AC2	Time: 2018/05/26 - 00:58
Limit: FCC 15.231(b)	Engineer: Bruce Wang
Probe: VULB9162_0.03-8GHz	Polarity: Horizontal
EUT: LED Strip Light Remote Control	Power: By Battery
Test Mode: Transmit at channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	434.005	43.416	17.508	N/A	60.924	100.825	-39.901	PK
	434.005	43.416	17.508	-6.595	54.329	80.825	-26.496	AV
2	868.080	34.592	23.972	N/A	57.376	80.825	-23.449	PK
	868.080	34.592	23.972	-6.595	50.781	60.825	-10.044	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

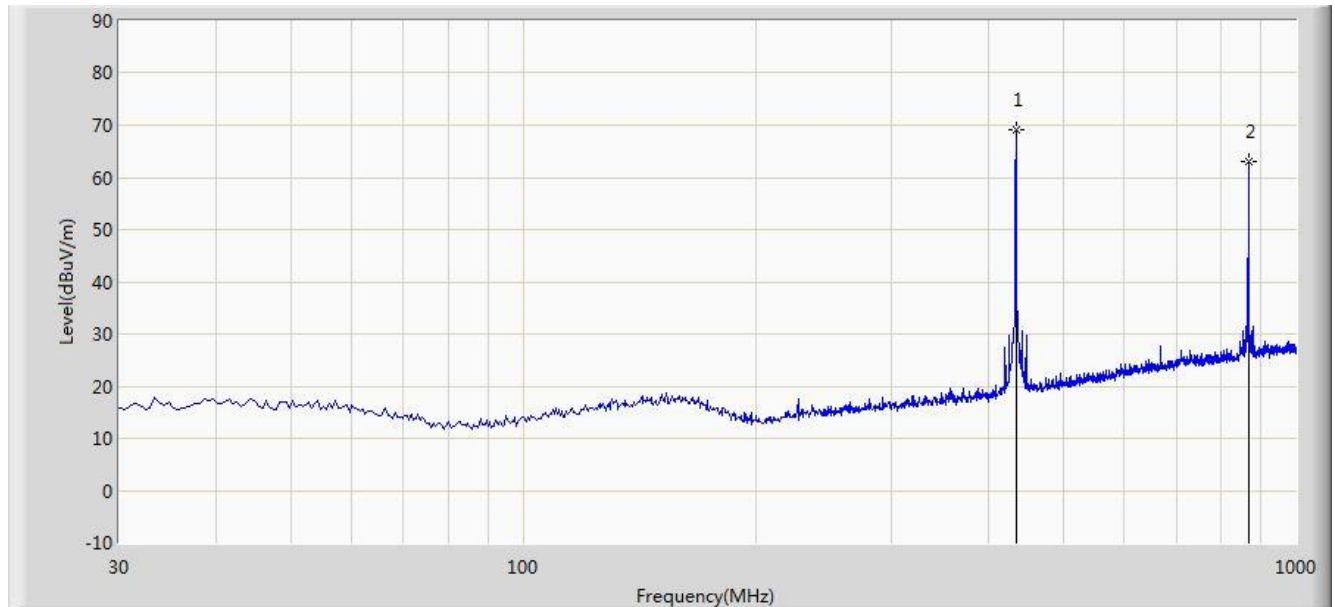
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC2	Time: 2018/05/26 - 01:03
Limit: FCC 15.231(b)	Engineer: Bruce Wang
Probe: VULB9162_0.03-8GHz	Polarity: Vertical
EUT: LED Strip Light Remote Control	Power: By Battery
Test Mode: Transmit at channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	434.005	51.585	17.508	N/A	69.093	100.825	-31.732	PK
	434.005	51.585	17.508	-6.595	62.498	80.825	-18.327	AV
2	868.080	38.954	23.972	N/A	60.459	80.825	-20.366	PK
	868.080	38.954	23.972	-6.595	53.864	60.825	-6.961	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

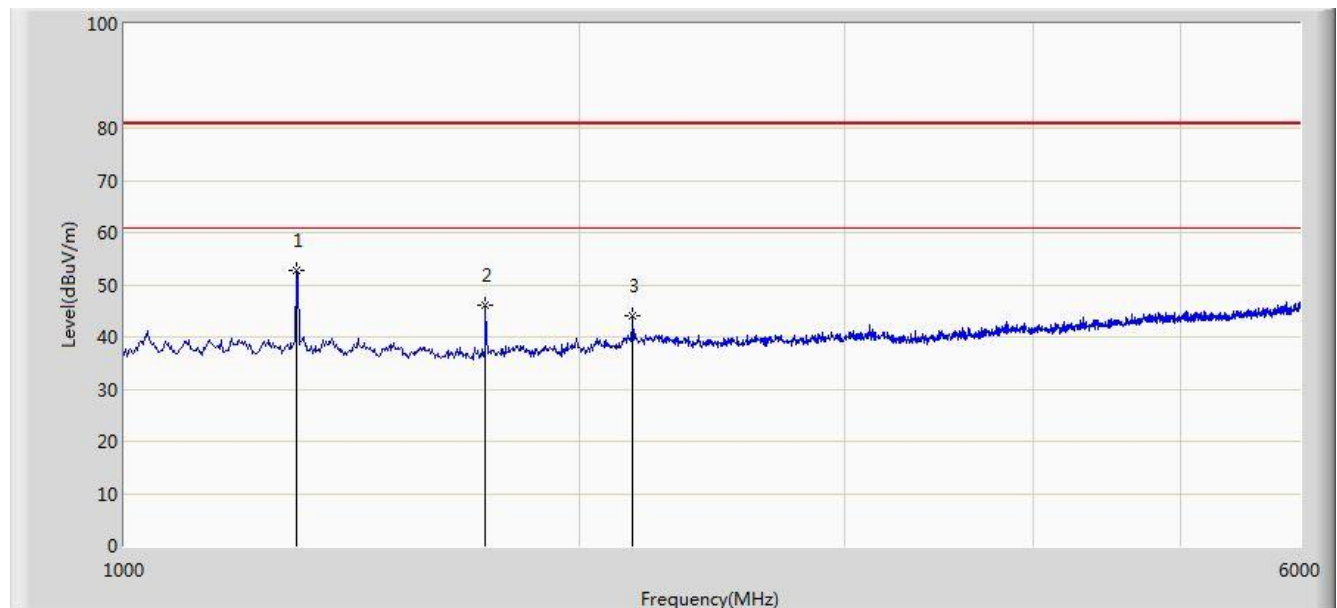
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m).

Site: AC2	Time: 2018/05/26 - 04:43
Limit: FCC 15.231(b)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Horizontal
EUT: LED Strip Light Remote Control	Power: By Battery
Test Mode: Transmit at channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	1300.000	56.898	-4.116	N/A	52.782	80.825	-28.043	PK
	1300.000	56.89	-4.116	-6.595	46.187	60.825	-14.638	AV
2	1735.000	50.087	-4.025	N/A	46.062	80.825	-34.763	PK
	1735.000	50.087	-4.025	-6.595	39.467	60.825	-21.358	AV
3	2170.000	45.084	-0.940	N/A	44.144	80.825	-36.681	PK
	2170.000	45.084	-0.940	-6.595	37.549	60.825	-23.276	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

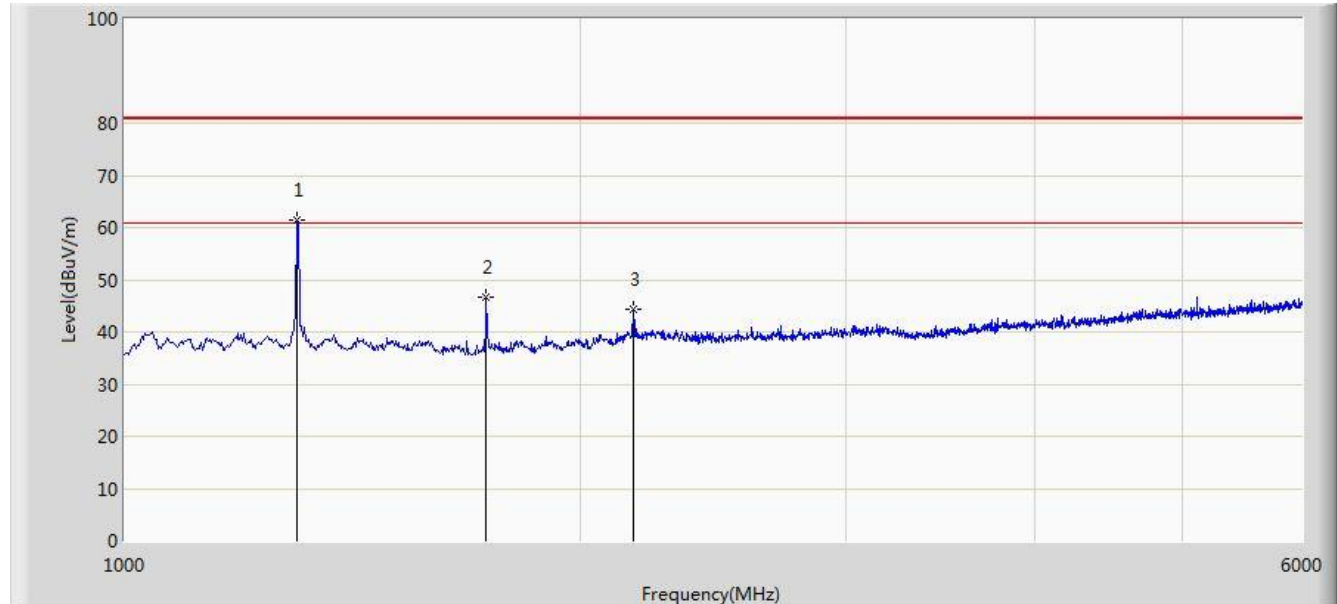
Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre_Amplifier Gain (dB).

Site: AC2	Time: 2018/05/26 - 04:45
Limit: FCC 15.231(b)	Engineer: Bruce Wang
Probe: BBHA9120D_1-18GHz	Polarity: Vertical
EUT: LED Strip Light Remote Control	Power: By Battery
Test Mode: Transmit at channel 433.92MHz	



No	Frequency (MHz)	Reading Level (dBuV)	Factor (dB)	Duty Cycle Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Type
1	1300.000	65.578	-4.116	N/A	61.462	80.825	-19.363	PK
	1300.000	65.578	-4.116	-6.595	54.867	60.825	-5.958	AV
2	1735.000	50.720	-4.025	N/A	46.695	80.825	-34.130	PK
	1735.000	50.720	-4.025	-6.595	40.100	60.825	-20.725	AV
3	2170.000	45.318	-0.940	N/A	44.378	80.825	-36.447	PK
	2170.000	45.318	-0.940	-6.595	37.783	60.825	-23.042	AV

Note 1: Testing is carried out with frequency rang 9 kHz to the tenth harmonics. There is the ambient noise within frequency range 9 kHz ~ 30 MHz, the permissible value is not show in the report.

Note 2: The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Note 3: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB).

AV Measure Level = Peak Measure Level + Duty Cycle Factor.

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) – Pre_Amplifier Gain (dB).

6.3. 20dB Bandwidth

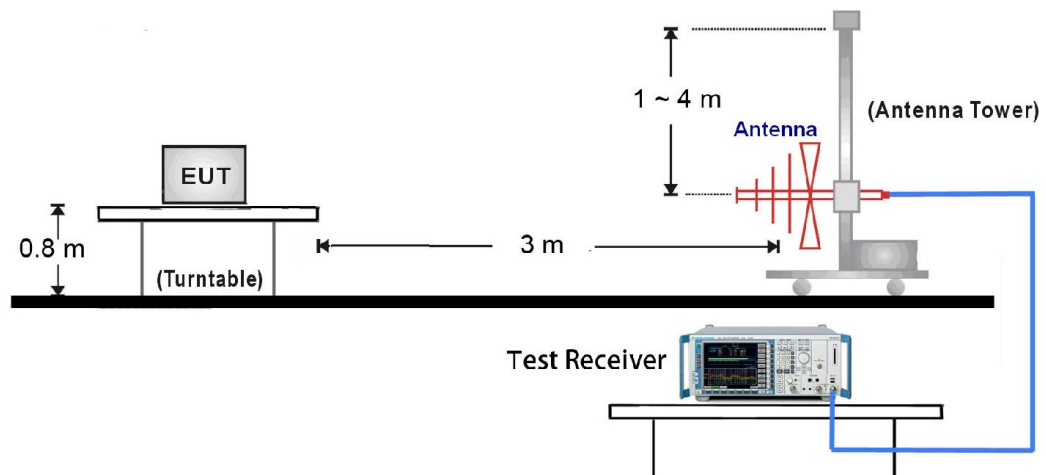
6.3.1. Standard Applicable

According to FCC Part 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

6.3.2. Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

6.3.3. Test Setup

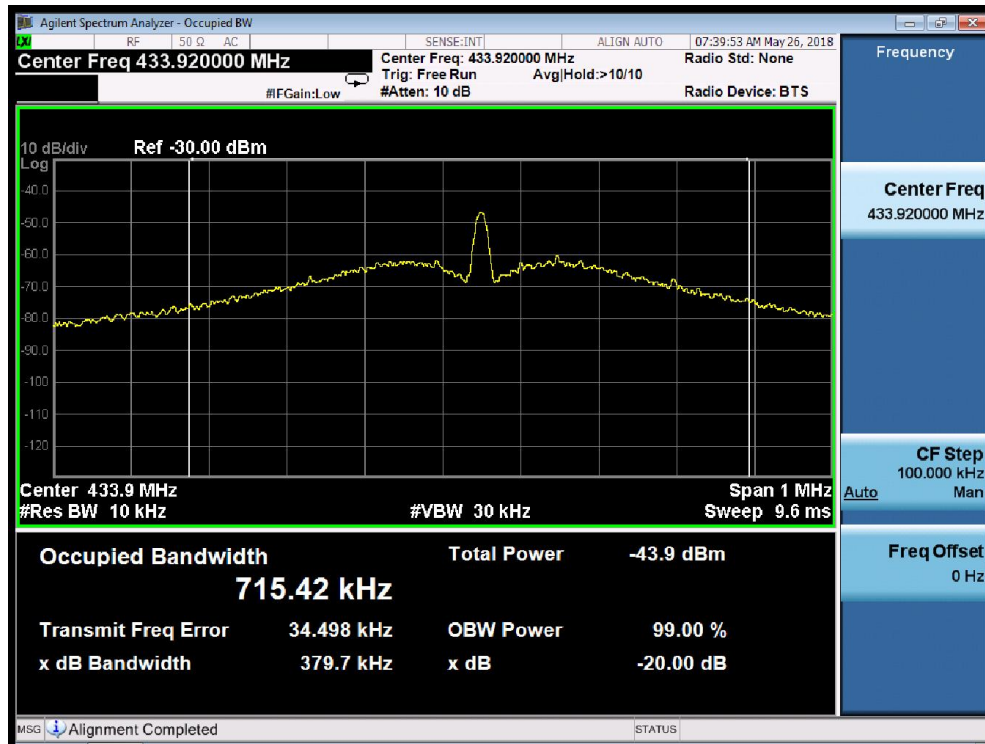


6.3.4. Test Result

Test Frequency (MHz)	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit (KHz)	Result
433.92	379.70	715.42	≤ 1084.8	Pass

Limit = Fundamental Frequency * 0.25% = 433.92MHz * 0.25% = 1084.8KHz

20dB Bandwidth Test Plot



6.4. Release Time

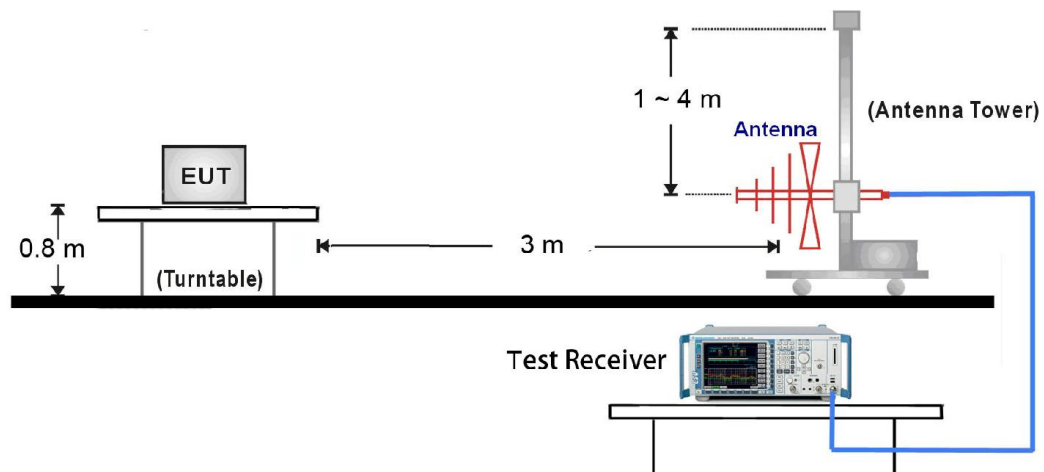
6.4.1. Standard Applicable

According to 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.

6.4.2. 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 to 433.92MHz, then set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

6.4.3. Test Setup

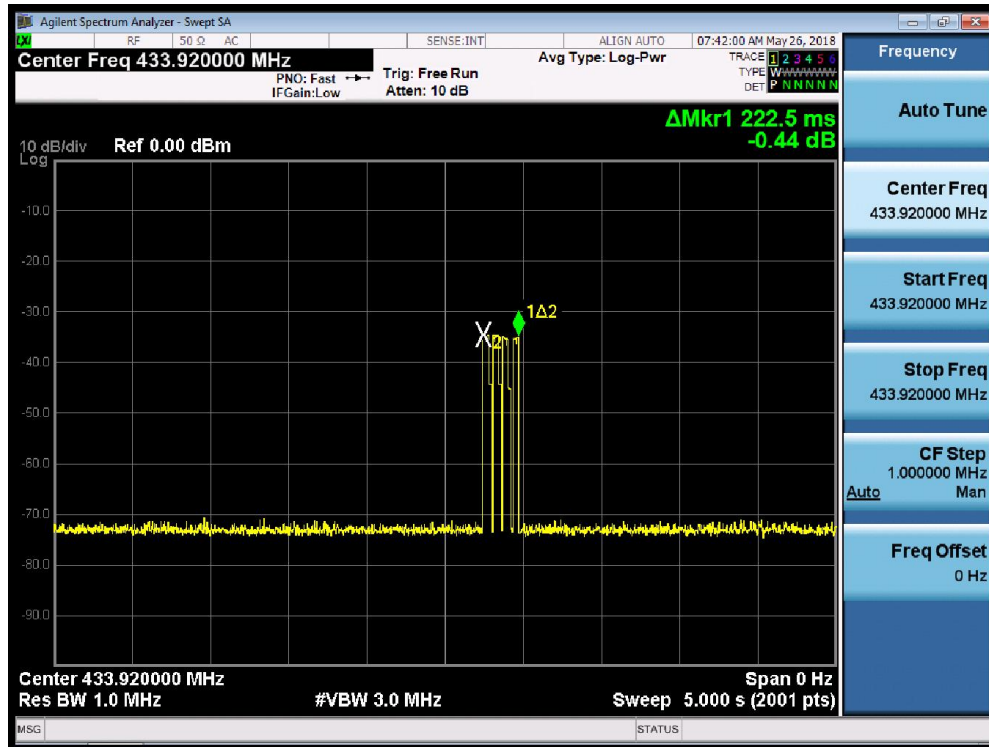


6.4.4. Test Result

Item	Measured Value	Limit	Result
Release Time	0.2225 s	≤ 5 s	Pass

Measure Value = Release_(on time) = 222.5ms

Release Time



6.5. Duty Cycle

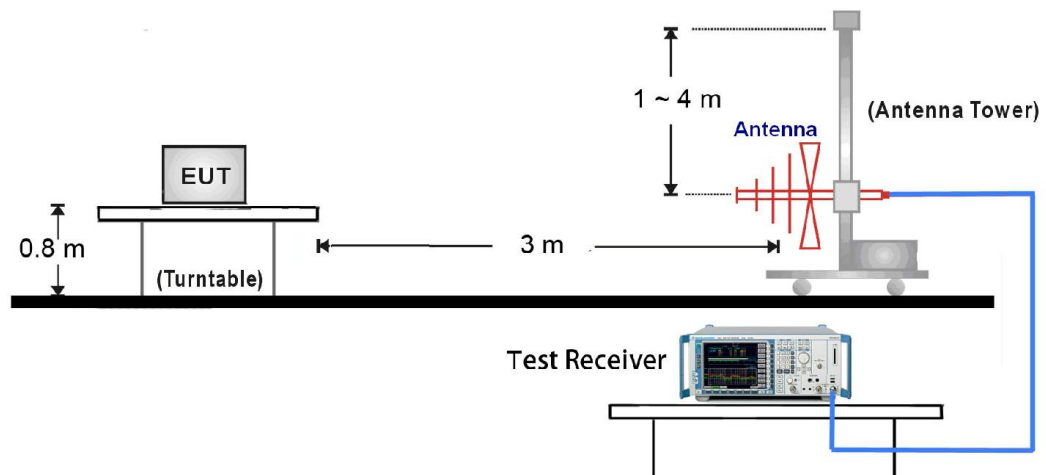
6.5.1. Standard Applicable

According to FCC Part 15.231(b) and 15.35(c), for pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

6.5.2. 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 to 433.92MHz, then set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

6.5.3. Test Setup



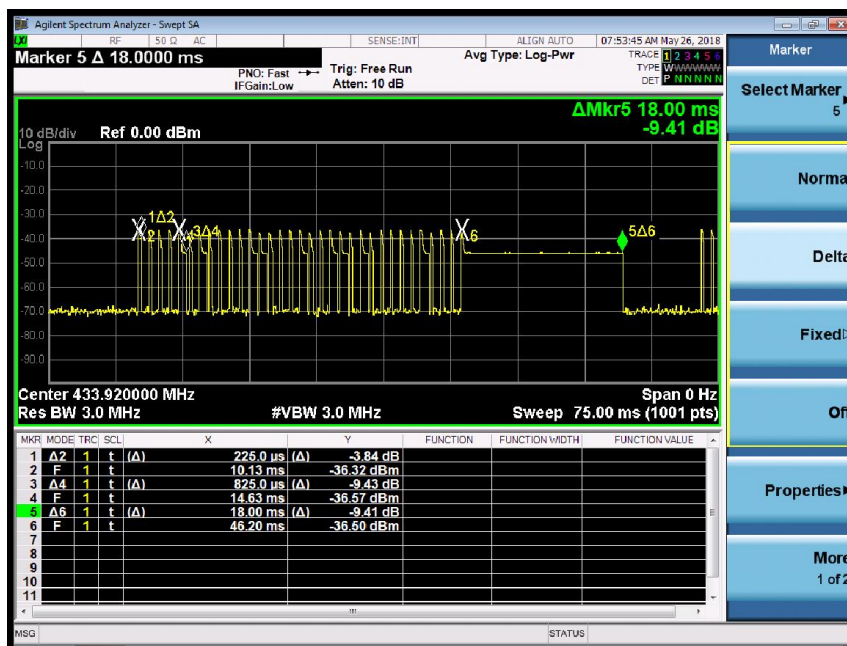
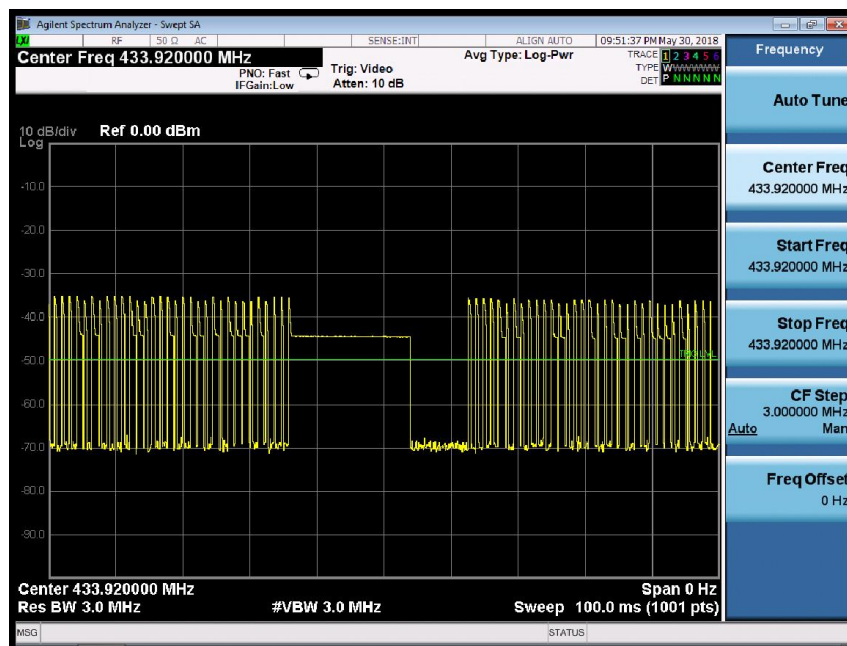
6.5.4. Test Result

Test Frequency (MHz)	Total Time (Ton) (ms)	The duration of one cycle(ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
433.92	46.80	100	46.80	-6.595

Note: Duty Cycle Factor = $20 \cdot \log(\text{Duty Cycle})$.

Total Time (T_{on})(ms)= $0.225 \cdot 40 + 0.825 \cdot 24 + 18.000 \cdot 1 = 46.80(\text{ms})$

Width of Pulse



7. CONCLUSION

The data collected relate only the item(s) tested and show that the device is in compliance with FCC Part 15.231(a) of the FCC Rules and RSS-210 Issue 9 – Annex A of IC Rules.

The End