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HUI ZHOU CITY TIAN XUN INDUSTRIAL LIMITED

TEST REPORT

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DOCUMENT CONTROL NUMBER

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Radio Spectrum
TEST REPORT

Applicant:	**HUI ZHOU CITY TIAN XUN INDUSTRIAL LIMITED HONG TIAN VILLAGE, XIN XU TOWN, HUI YANG AREA, HUI ZHOU CITY, GUANGDONG PROVINCE, CHINA**
Product:	**String Light (With remote controller)**
Model No.: (Remoter controller)	**89466-95**
FCC ID: (Only for Remote controller)	**2AUT589466**
Model No.: (String Light)	**LP-V24, LP-V18, LP-V15, LP-V12, LP-V10**
Brand Name:	**NIL**
Test Method/ Standard:	**47 CFR FCC Part 15.231**
Note:	**The test results only applied with remote controller.**
Test By:	**Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan**

Testing Laboratory
0597

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Revision History

Report No.	Issue Date	Revision Summary
191000265TWN-001	Nov. 15, 2019	Original report

Table of Contents

Summary of Test Data 4

1. General Information 5
   1.1 Identification of the EUT 5
   1.2 Additional Information about the Remote Controller and the String Light 5
   1.3 Adapter Information for String Light 5
   1.4 Antenna description 5

2. Test specifications 6

3. Radiated emission test FCC 15.231 (b) 7
   3.2.1 Radiated emission from 9kHz to 30MHz uses Loop Antenna: 7
   3.2.2 Radiated emission below 1GHz using Bilog Antenna 8
   3.2.3 Radiated emission above 1GHz using Horn Antenna 8

4. Measured bandwidth FCC 15.231(C) 20

5. Timing requirement of manual activation operated transmitter 21

6. Conducted emission FCC 15.207 22

Appendix A: Test equipment list 23

Appendix B: Measurement Uncertainty 24

Summary of Test Data

Test Requirement	Applicable Rule	Result
Radiated Emission test	15.231(b), 15.209	Pass
Measured bandwidth	15.231(c)	Pass
Timing requirement of manually operated transmitter	15.231(a)(1)	Pass
Conducted Emission test	15.207	N/A
Antenna Requirement	15.203	Pass

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.
Other Testing: the specification, standard and not taking into account the measurement uncertainty.

1. General Information

1.1 Identification of the EUT

Product:	Remote controller
Model No.:	89466-95
Operating Frequency:	433.99 MHz
Rated Power:	DC 3V from battery
Power Cord:	N/A
Sample receiving date:	Sep. 12, 2019
Sample condition:	Workable
Test Date(s):	Oct. 15, 2019 ~ Nov. 15, 2019

1.2 Additional Information about the Remote Controller and the String Light

This remote controller can be used with different string light. The explanation of differences is as below.

Product name	Model Number	Different
Remote controller	89466-95	-
String Light	LP-V24	24 lights
String Light	LP-V18	18 lights
String Light	LP-V15	15 lights
String Light	LP-V12	12 lights
String Light	LP-V10	10 lights

Note: The test results only applied with remote controller.

1.3 Adapter Information for String Light

The String Light will be supplied with a power supply from below list:

No.	Model no.	Specification
Adapter	RKPO-UL122000	I/P: 100-240V~,50-60Hz, 0.6A O/P: 12Vdc, 2000mA

1.4 Antenna description

Antenna Type : Printed Antenna

Connector Type : Fixed

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 2.1053 and the requirement in FCC Part 15 Subpart C Section 15.231.

2.2 Operation mode

TX mode: Press EUT button to transmit.

The signal is maximized through rotation and placement in the three orthogonal axes.

X axis

Y axis

Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at X axis. The final test data was executed under this configuration.

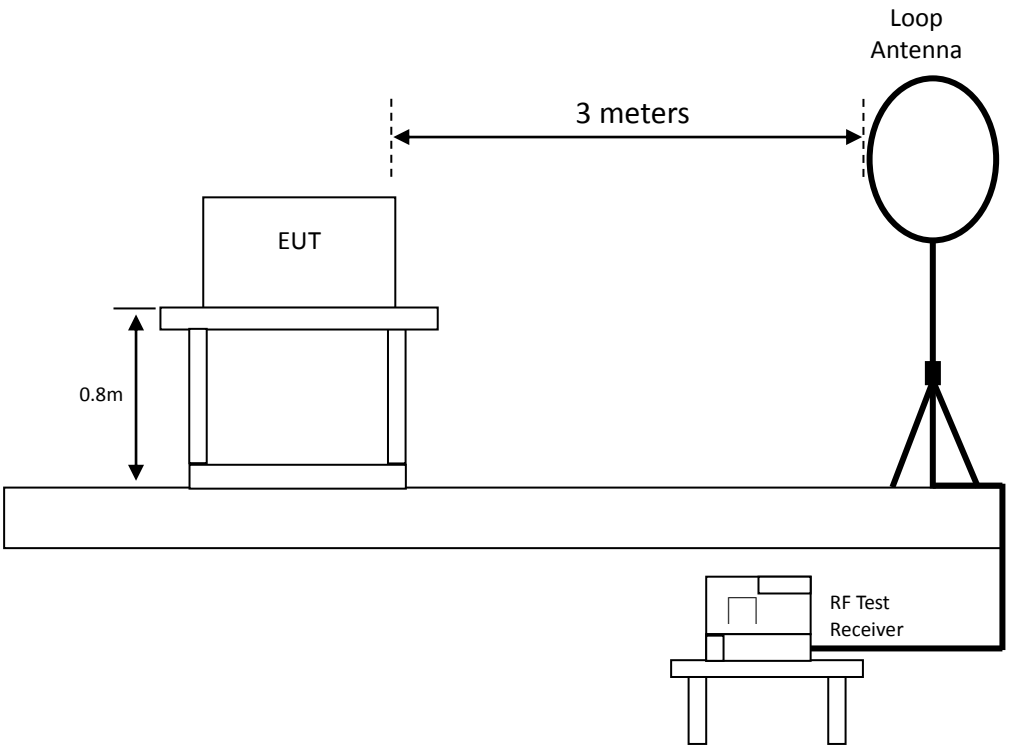
3. Radiated emission test FCC 15.231 (b)

3.1 Operating environment

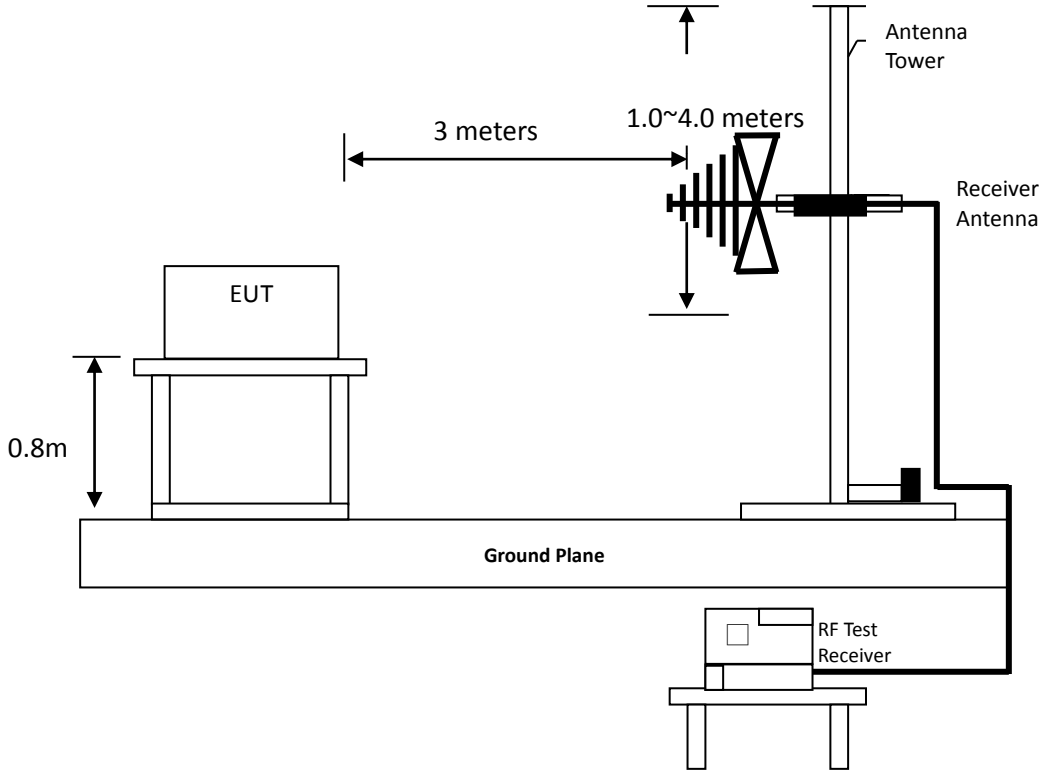
Temperature:	26	℃
Relative Humidity:	57	%

3.2 Test setup & procedure

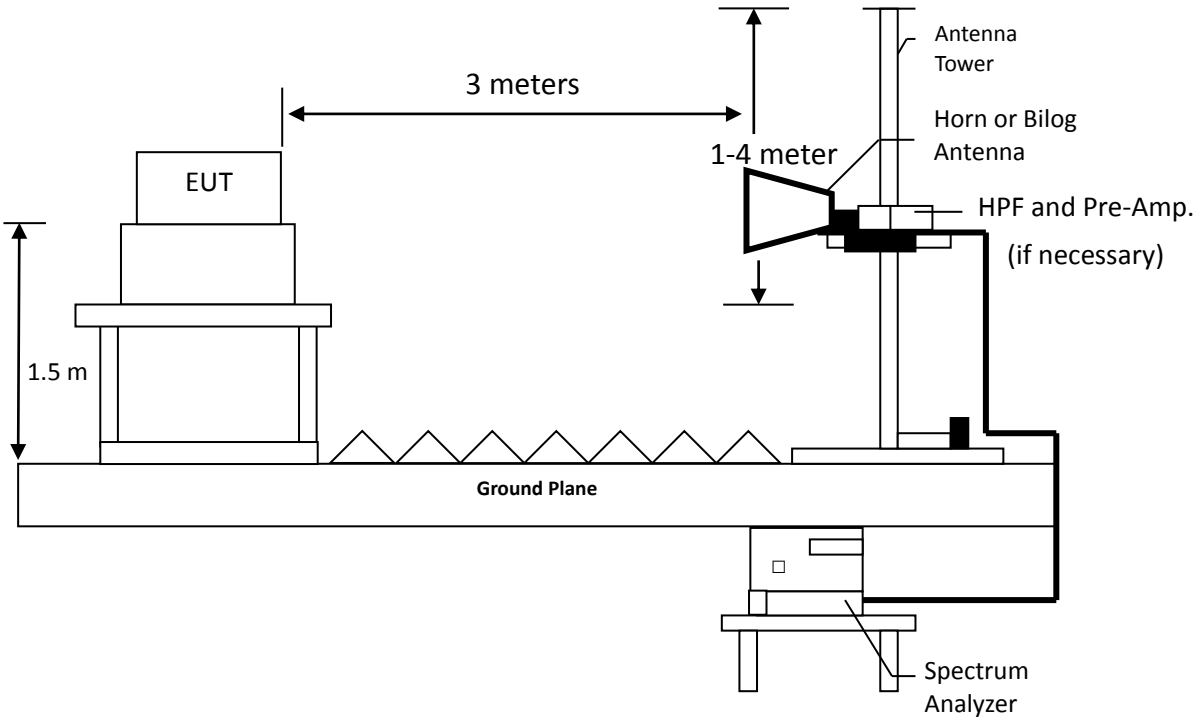
3.2.1 Radiated emission from 9kHz to 30MHz uses Loop Antenna:



3.2.2 Radiated emission below 1GHz using Bilog Antenna



3.2.3 Radiated emission above 1GHz using Horn Antenna



3.3 Radiated emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(uV/m@3 m)	(dBuV/m@3 m)	(uV/m@3 m)	(dBuV/m@3 m)
433.99	10999.6	80.82	1099.9	60.82

3.3.2 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency MHz	15.209 Limits (dBµV/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

3.4 Radiated emission test data FCC 15.231

3.4.1 Measurement results: Fundamental emission

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
433.99	PK	V	25.15	24.84	49.99	100.82	-50.83
433.99	AV	V	25.15	20.95	46.10	80.82	-34.72
433.99	PK	H	25.15	37.69	62.84	100.82	-37.98
433.99	AV	H	25.15	33.82	58.97	80.82	-21.85

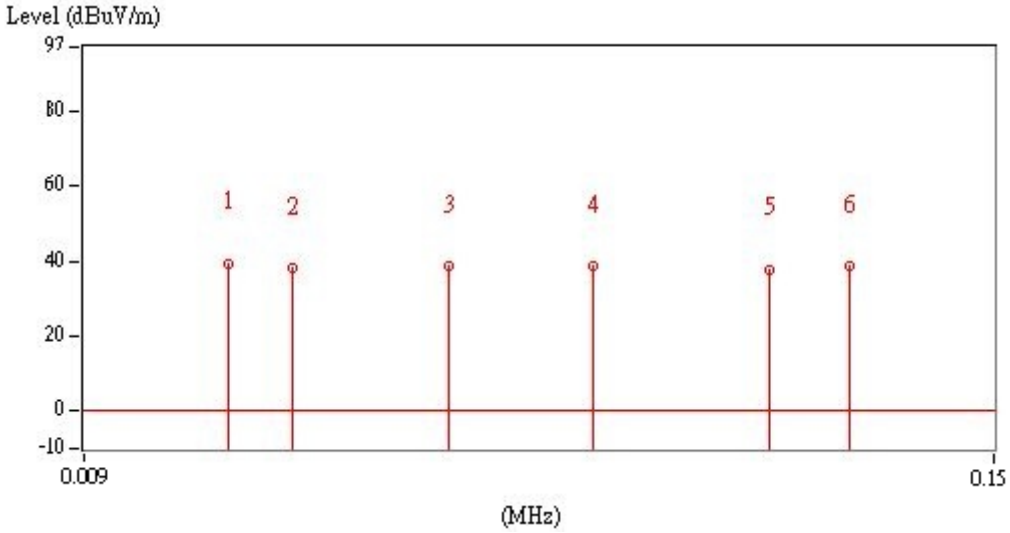
Remark: Corr. Factor = Antenna Factor + Cable Loss

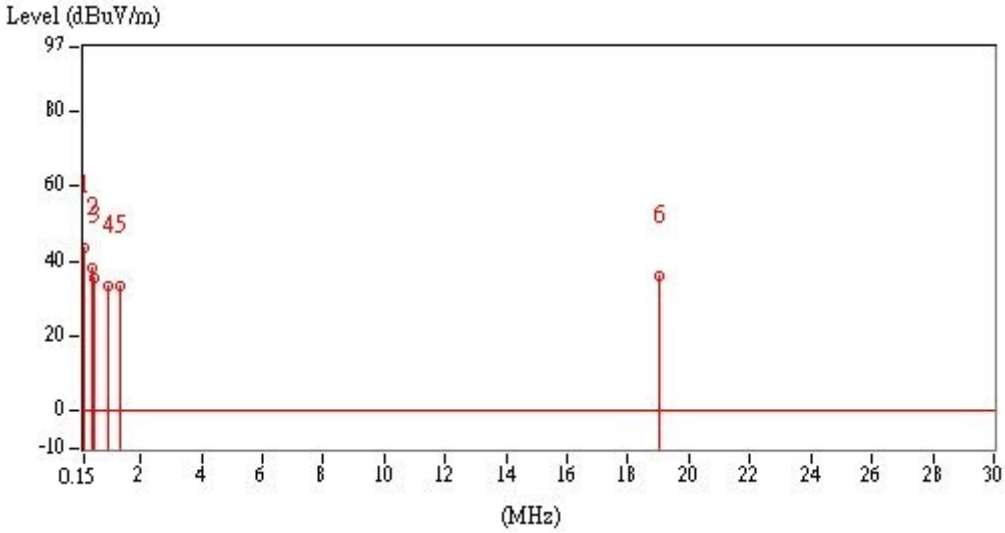
3.4.2 Measurement results: frequencies equal to or less than 1 GHz

Test condition : Tx mode

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Perpendicular	0.03	AV	19.06	20.30	39.36	118.06	-78.70
Perpendicular	0.04	AV	18.86	19.37	38.23	115.56	-77.33
Perpendicular	0.07	AV	18.57	20.13	38.70	110.70	-72.00
Perpendicular	0.09	AV	18.40	20.11	38.51	108.52	-70.01
Perpendicular	0.12	AV	18.32	19.53	37.85	106.02	-68.17
Perpendicular	0.13	AV	18.33	20.14	38.47	105.33	-66.86
Perpendicular	0.15	AV	18.34	25.40	43.74	104.08	-60.34
Perpendicular	0.39	AV	18.47	19.75	38.22	95.78	-57.56
Perpendicular	0.51	QP	18.54	17.14	35.68	73.45	-37.77
Perpendicular	0.93	QP	18.82	14.44	33.26	68.23	-34.97
Perpendicular	1.34	QP	18.88	14.24	33.12	65.06	-31.94
Perpendicular	19.02	QP	21.31	14.52	35.83	69.54	-33.71

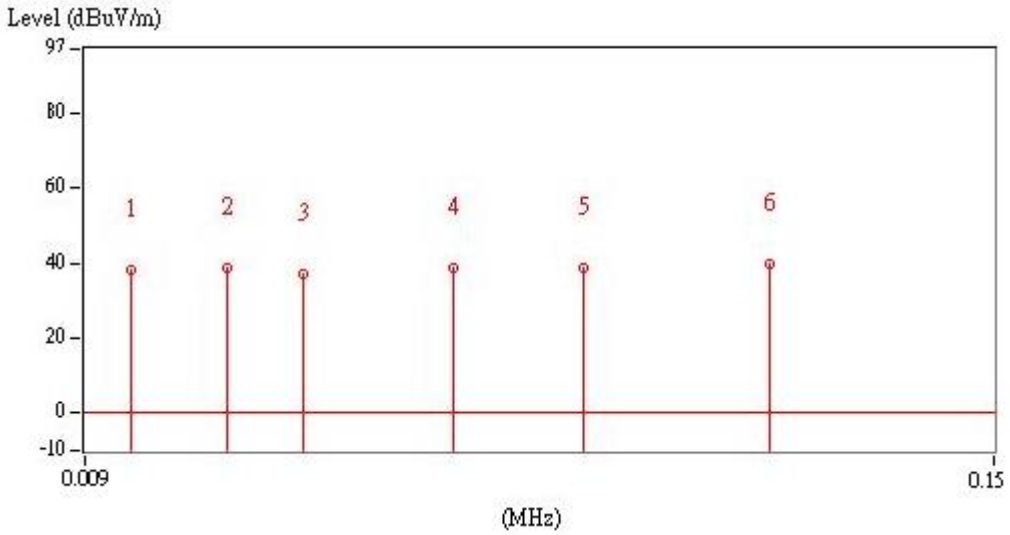
Remark: Corr. Factor = Antenna Factor + Cable Loss

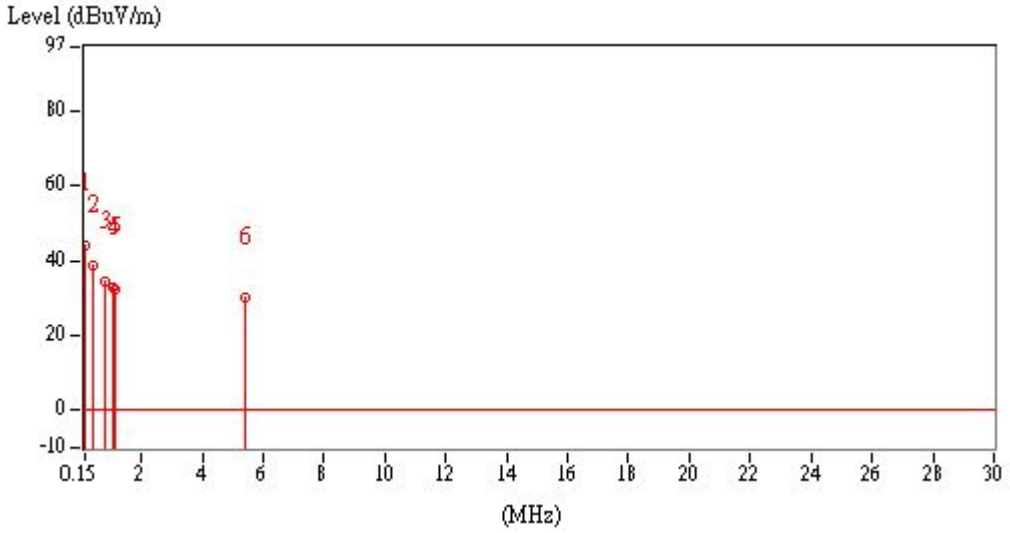

Level (dBuV/m)
97
80
60
40
20
0
-10
1
2
3
4
5
6
0.009
0.15
(MHz)


Level (dBuV/m)
97
80
60
40
20
0
-10
1
2
3
45
6
0.15
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
(MHz)

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Parallel	0.02	AV	18.66	19.22	37.88	121.58	-83.70
Parallel	0.03	AV	19.07	19.56	38.63	118.06	-79.43
Parallel	0.04	AV	18.83	18.15	36.98	115.56	-78.58
Parallel	0.07	AV	18.57	20.06	38.63	110.70	-72.07
Parallel	0.09	AV	18.41	20.10	38.51	108.52	-70.01
Parallel	0.12	AV	18.32	21.42	39.74	106.02	-66.28
Parallel	0.15	AV	18.34	25.80	44.14	104.08	-59.94
Parallel	0.39	AV	18.47	19.97	38.44	95.78	-57.34
Parallel	0.81	QP	18.73	15.74	34.47	69.43	-34.96
Parallel	1.05	QP	18.86	13.95	32.81	67.18	-34.37
Parallel	1.16	QP	18.87	13.63	32.50	66.32	-33.82
Parallel	5.40	QP	19.44	10.67	30.11	69.54	-39.43

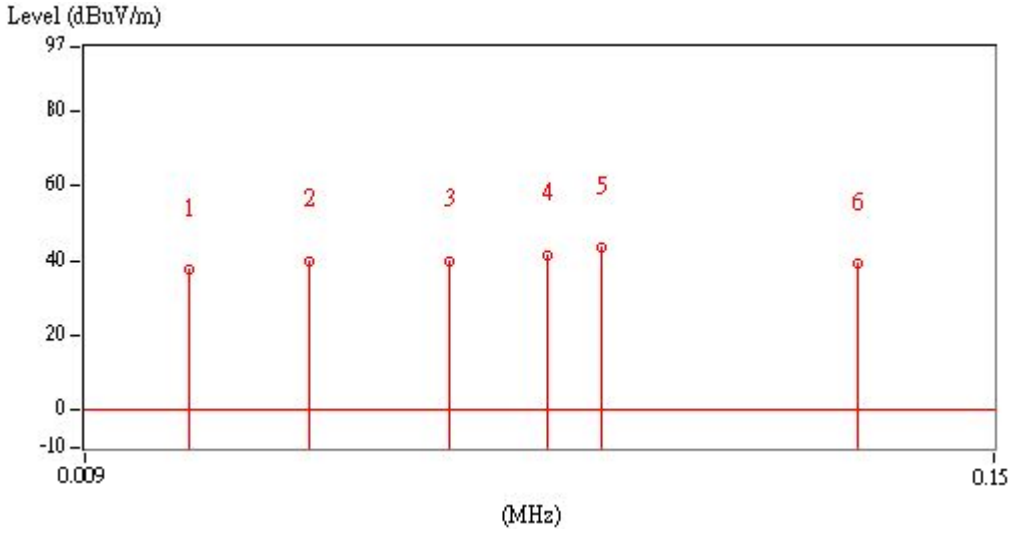
Remark: Corr. Factor = Antenna Factor + Cable Loss

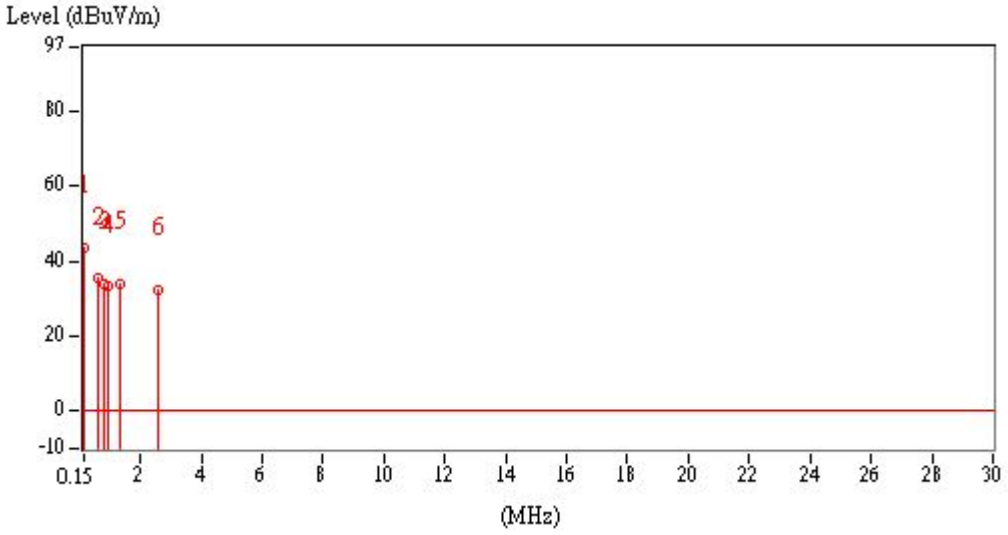

Level (dBuV/m)
97
80
60
40
20
0
-10
1
2
3
4
5
6
0.009
0.15
(MHz)


Level (dBuV/m)
97
80
60
40
20
0
-10
1
2
3
4
5
6
0.15
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
(MHz)

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Ground-parallel	0.03	AV	18.94	18.55	37.49	118.06	-80.57
Ground-parallel	0.04	AV	18.82	21.06	39.88	115.56	-75.68
Ground-parallel	0.07	AV	18.57	21.35	39.92	110.70	-70.78
Ground-parallel	0.08	AV	18.46	23.07	41.53	109.54	-68.01
Ground-parallel	0.09	AV	18.39	24.89	43.28	108.52	-65.24
Ground-parallel	0.13	AV	18.33	20.78	39.11	105.33	-66.22
Ground-parallel	0.15	AV	18.34	25.35	43.69	104.08	-60.39
Ground-parallel	0.63	QP	18.62	16.86	35.48	71.62	-36.14
Ground-parallel	0.81	QP	18.73	15.32	34.05	69.43	-35.38
Ground-parallel	0.93	QP	18.82	14.48	33.30	68.23	-34.93
Ground-parallel	1.34	QP	18.88	15.19	34.07	65.06	-30.99
Ground-parallel	2.60	QP	18.96	13.53	32.49	69.54	-37.05

Remark: Corr. Factor = Antenna Factor + Cable Loss

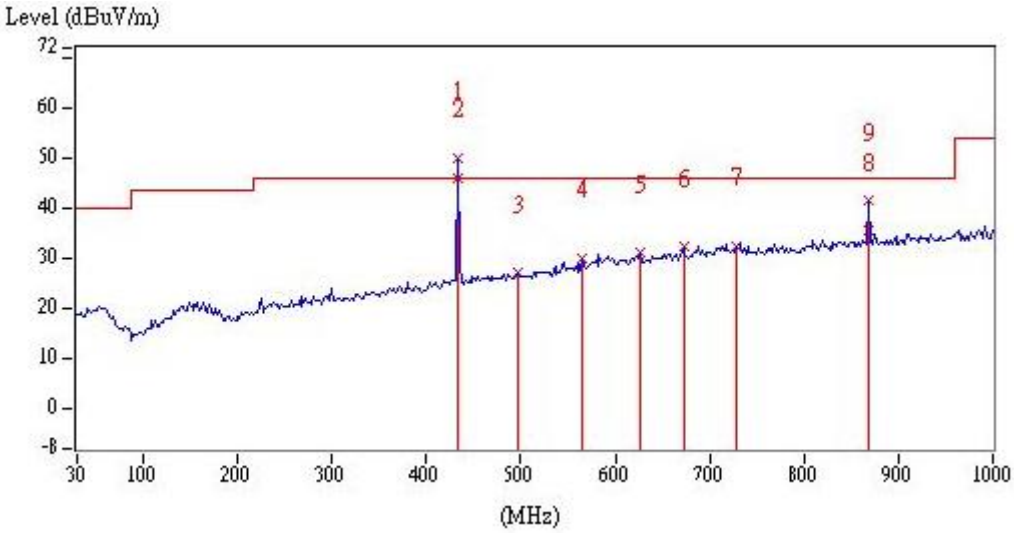

Level (dBuV/m)
97
80
60
40
20
0
-10
1
2
3
4
5
6
0.009
0.15
(MHz)


Level (dBuV/m)
97
80
60
40
20
0
-10
1
2
4
5
6
0.15
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
(MHz)

Test condition : Tx mode

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Vertical	497.54	QP	26.30	0.82	27.12	60.82	-33.70
Vertical	565.44	QP	27.70	2.43	30.13	60.82	-30.69
Vertical	625.58	QP	28.96	2.15	31.11	60.82	-29.71
Vertical	672.14	QP	29.56	2.69	32.25	60.82	-28.57
Vertical	728.40	QP	30.44	2.08	32.52	60.82	-28.30
Vertical	867.98	QP	32.36	3.14	35.50	60.82	-25.32

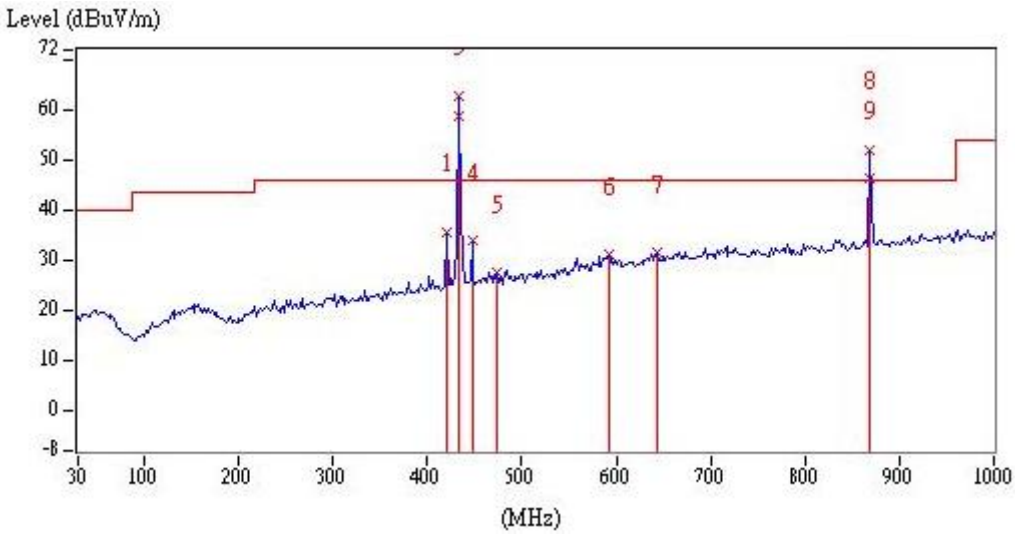
Remark: Corr. Factor = Antenna Factor + Cable Loss



Test condition : Tx mode

Ant Polarity	Frequency (MHz)	Detector	Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3m (dBµV/m)	Margin (dB)
Horizontal	419.94	QP	24.77	10.86	35.63	60.82	-25.19
Horizontal	447.10	QP	25.51	8.30	33.81	60.82	-27.01
Horizontal	474.26	QP	25.95	1.50	27.45	60.82	-33.37
Horizontal	592.60	QP	28.43	2.61	31.04	60.82	-29.78
Horizontal	643.04	QP	29.19	2.32	31.51	60.82	-29.31
Horizontal	867.98	QP	32.36	13.87	46.23	60.82	-14.59

Remark: Corr. Factor = Antenna Factor + Cable Loss



3.4.3 Measurement results: frequency above 1GHz

Test condition : Tx mode

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1301.97	PK	V	-6.91	47.17	40.26	80.82	-40.56
1301.97	AV	V	-6.91	45.24	38.33	60.82	-22.49
1735.96	PK	V	-5.03	42.69	37.66	80.82	-43.16
1735.96	AV	V	-5.03	40.72	35.69	60.82	-25.13
2169.95	PK	V	-3.25	48.98	45.73	80.82	-35.09
2169.95	AV	V	-3.25	47.03	43.78	60.82	-17.04
2603.94	PK	V	-1.56	38.94	37.38	80.82	-43.44
2603.94	AV	V	-1.56	36.90	35.34	60.82	-25.48
3037.93	PK	V	-0.40	36.24	35.84	80.82	-44.98
3037.93	AV	V	-0.40	34.20	33.80	60.82	-27.02
3471.92	PK	V	0.54	33.80	34.34	80.82	-46.48
3471.92	AV	V	0.54	31.84	32.38	60.82	-28.44
1301.97	PK	H	-6.91	55.60	48.69	80.82	-32.13
1301.97	AV	H	-6.91	53.69	46.78	60.82	-14.04
1735.96	PK	H	-5.03	52.13	47.10	80.82	-33.72
1735.96	AV	H	-5.03	50.24	45.21	60.82	-15.61
2169.95	PK	H	-3.25	61.55	58.30	80.82	-22.52
2169.95	AV	H	-3.25	58.12	54.87	60.82	-5.95
2603.94	PK	H	-1.56	51.28	49.72	80.82	-31.10
2603.94	AV	H	-1.56	49.39	47.83	60.82	-12.99
3037.93	PK	H	-0.40	45.14	44.74	80.82	-36.08
3037.93	AV	H	-0.40	43.30	42.90	60.82	-17.92
3471.92	PK	H	0.54	39.74	40.28	80.82	-40.54
3471.92	AV	H	0.54	37.91	38.45	60.82	-22.37

Remark: Corr. Factor = Antenna Factor + Cable Loss

4. Measured bandwidth FCC 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 20dB down from the modulated carrier.

B.W(20dBc) Limit = 0.25% × f(MHz) = 0.25% × 433.99 MHz = 1.08497 MHz

From the plot, the bandwidth is observed to be 580.8 kHz at 20dBc, where the bandwidth limit is 1.08497 MHz.

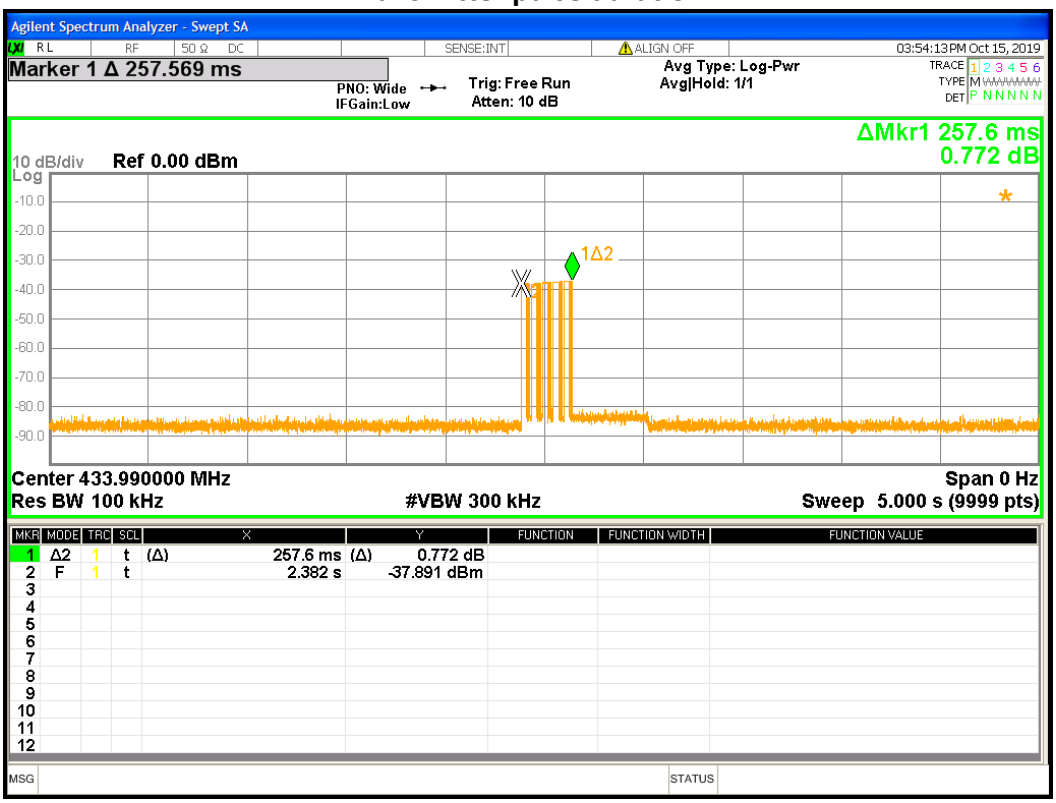
Please see the plot below.

Bandwidth

5. Timing requirement of manual activation operated transmitter

A transmitter manual activation shall cease transmission within 5 seconds after activation

Transmitter pulse duration



6. Conducted emission FCC 15.207

Since the EUT is not connected to AC source, therefore, the test can be waived.

Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
ESCI EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2018/11/14	2019/11/13
Signal Analyzer	Agilent	N9030A	MY51380492	2019/08/21	2020/08/19
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2019/04/19	2020/04/17
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2019/06/05	2020/06/03
Horn Antenna	SHWARZBECK	BBHA 9120 D	9120D-456	2019/02/01	2020/01/31
966-2(A) Cable 9kHz~26.5GHz	SUHNER	SMA / EX 100	N/A	2019/08/19	2020/08/17
966-2(B) Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 104P	CB0005	2019/08/19	2020/08/17
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2019/02/23	2020/02/22

Note: No Calibration Required (NCR)

Appendix B: Measurement Uncertainty

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

Item	Uncertainty
Timing requirement of manually operated transmitter	1.15 dB
20dB Bandwidth	7.69 %
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	2.99 dB
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	4.90 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	4.89 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	4.29 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	4.29 dB
AC Power Line Conducted Emission	2.52 dB