TEST REPORT

1. Applicant		
Name	:	CG Lighting Co.,LTD
Address	:	C-509, #537-59, 40, Imi-ro, Uiwang-si, Gyeonggi-do, Korea
FCC ID	:	2ALXRCG-RCZB
2. Products		
Name	:	Wireless Remote Control
Model No.	:	CG-RCZB
Variant Model No.	:	N/A
Manufacturer	:	CG Lighting Co.,LTD
Address	:	C-509, #537-59, 40, Imi-ro, Uiwang-si, Gyeonggi-do, Korea
3. Test Standard	:	47 CFR PART 15 Subpart C section 15.249
4. Test Method	:	ANSI C63.10:2013
5. Test Result	:	PASS
6. Dates of Test	:	April 5, 2017 to April 12, 2017
7. Date of Issue	:	April 26, 2016
8. Test Laboratory	:	Standard Engineering Co. Ltd. FCC Designation Number : 624439

Tested by	Approved by
	
SoonHo, Kim / Test Engineer	SeongSeok, Seo / Compliance Engineer

Standard Engineering Co. Ltd.
377-11, Sinjang-ri, Eumam-myeon, Seosan-si,
ChoongNam 356-844, South Korea
Tel.: +82-41-663-9436, Fax :+82-41-663-9434
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1. Test Summary

Test	Test Requirement	Test method	Result
Antenna Requirement	FCC PART 15 C Section 15.203	FCC PART 15 C Section 15.203	PASS
Occupied Bandwidth	FCC PART 15 C section 15.215(c)	ANSI C63.10: Clause 6.9	PASS
Radiated Emissions	FCC PART 15 C section 15.249 (a), (d)	ANSI C63.10: Clause 6.4, 6.5 & 6.6	PASS

- Remark:
  This product has a transmitter and a receiver.
  The remote control has only transmit mode.
  The converter only has a receive mode.

2. TABLE OF CONTENTS

3. General Information

3.1. Client Information

Applicant	:	CG Lighting Co.,LTD
Address of Applicant	:	C-509, #537-59, 40, Imi-ro, Uiwang-si, Gyeonggi-do, Korea
Manufacturer	:	CG Lighting Co.,LTD
Address of Manufacturer	:	C-509, #537-59, 40, Imi-ro, Uiwang-si, Gyeonggi-do, Korea

3.2. General Description of E.U.T.

Product Name	:	Wireless Remote Control
Model No.	:	CG-RCZB

3.3. Details of E.U.T.

Operation Frequency	:	2422 MHz
Channel Numbers	:	1
Modulation Type	:	GFSK
Antenna Type	:	Pattern antenna
Antenna Gain	:	2.34 dBi
Power Supply	:	DC 3.0 V
Test Voltage	:	DC 3.0 V

3.4. Test Environment and Mode

Operating Environment:		
Temperature	:	18.9 ℃
Humidity	:	47% RH
Atmospheric Pressure	:	1081 mbar
Test mode:		
Transmitting mode	:	Keep the EUT in transmitting mode with modulation.

3.5. Description of Support Units

The EUT has been tested independent unit.

3.6. Abnormalities from Standard Conditions

None.

3.7. Other Information Requested by the Customer

None.

3.8. Test Location

377-11, Sinjang-ri, Eumam-myeon, Seosan-si, ChoongNam 356-844, South Korea
(FCC Designation Number : 624439)

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

4. Equipment Used during Test

No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Data
1	EMI Test Receiver	LIG	ER-265	L1009B016	03/02/2017	03/02/2018
2	EMI Test Receiver	Rhode & Schwarz	ESIB7	3311	09/02/2016	09/02/2017
3	Bi-log Antenna	Schwarzbeck	VULB9163	163	09/15/2015	09/30/2017
4	Loop Antenna	EMCO	6502	9206-2769	01/28/2016	01/28/2018
5	Spectrum Analyzer	Agilent	E4440A	US45303130	01/24/2017	01/24/2018
6	Power Meter	Agilent	E4418B	MY405111655	01/23/2017	01/23/2018
7	Power Sensor	HP	8485A	2347A02746	01/23/2017	01/23/2018
8	Signal Generator	HP	83630A	3420A00728	01/24/2017	01/24/2018
9	Pre Amplifier	Agilent	8449B	3008A02105	01/24/2017	01/24/2018
10	Signal Generator	Rhode & Schwarz	SML03	102330	01/23/2017	01/23/2018
11	POWER DIVIDER	Agilent	11636B	50309	01/23/2017	01/23/2018
12	Power Sensor	Agilent	8482B	3318A05111	01/23/2017	01/23/2018
13	DC Power Supply	HP	6032A	US35420383	01/23/2017	01/23/2018
14	Bandreject Filter	K&L Microwave	50140	555	01/23/2017	01/23/2018
15	Horn Antenna	Schwarzbeck	BBHA9120A	346	02/05/2016	02/05/2018
16	Horn Antenna	A.H. SYSTEMS	SAS-572	269	09/03/2015	09/03/2017
16	DC Power Supply	Provice	PWS-5005D	205051	01/23/2017	01/23/2018
17	LISN	Rhode & Schwarz	ESH2-Z5	100204	11/10/2016	11/10/2017
18	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100137	11/10/2016	11/10/2017
19	Digital Multimeter	DONG HWA	DM-1010	A323665	01/23/2017	01/23/2018
20	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100137	11/10/2016	11/10/2017
21	LISN	Rhode & Schwarz	ESH3-Z5	100204	11/10/2016	11/10/2017

5. Test Results and Measurement Data

5.1. Antenna Requirement

Standard requirement: 15.203 requirement

15.203 requirement:

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.

EUT Antenna

The antenna is an integral antenna and no consideration of replacement. The best case gain of the antenna is 2.34 dBi.

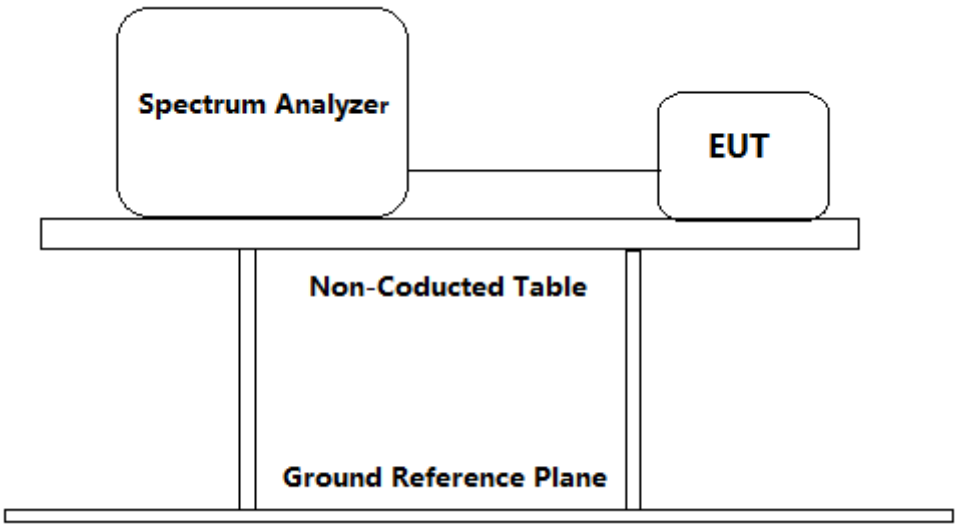
EUT Antenna **PASS**

The transmitter has an Integrated Pattern antenna. The directional gain of the antenna is 2.34 dBi. please refer to the EUT internal photos.

5.2. Occupied Bandwidth:

Test Requirement:	FCC PART 15 C section 15.215(c) (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in ㎜ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated
Test Method:	ANSI C63.10: Clause 6.9
Test Status:	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).

Test Configuration:

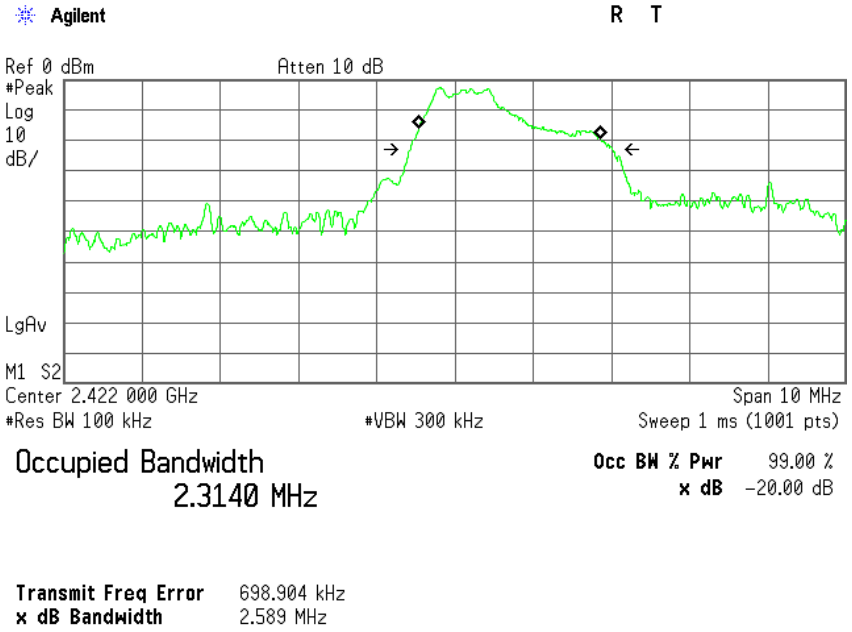


Test Procedure:
The transmitter was operated at its maximum carrier power measured under normal test conditions.
a) The instrument center frequency was set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer was between 1.5 times and 5.0 times the OBW(20 dB Bandwidth).
b) The nominal IF filter bandwidth (3 dB RBW) was in the range of 1% to 5% of the OBW, and VBW was approximately three times the RBW.
c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope was more than [10 log (OBW/RBW)] below the reference level.
d) Step a) through step c) might require iteration to adjust within the specified range.
e) The dynamic range of the instrument at the selected RBW was more than 10 dB below the target "−20 dB down"requirement; that is, if the requirement calls for measuring the −20 dB OBW, the instrument noise floor at the selected RBW was at least 30 dB below the reference value.
f) Peak detection and max hold mode (until the trace stabilizes) was used.
g) Used the 20dB bandwidth function of the instrument and reported the measured bandwidth.
h) The occupied bandwidth was reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division was clearly labeled. Tabular data was reported in addition to the plot(s).

20 dB bandwidth:

Frequency (㎒)	Measured 20 dB bandwidth (㎒)	Limit (㎒)	Result
2422	2.589	/	Pass

20dB bandwidth:
Result plot as follows:



5.3. Radiated Emission

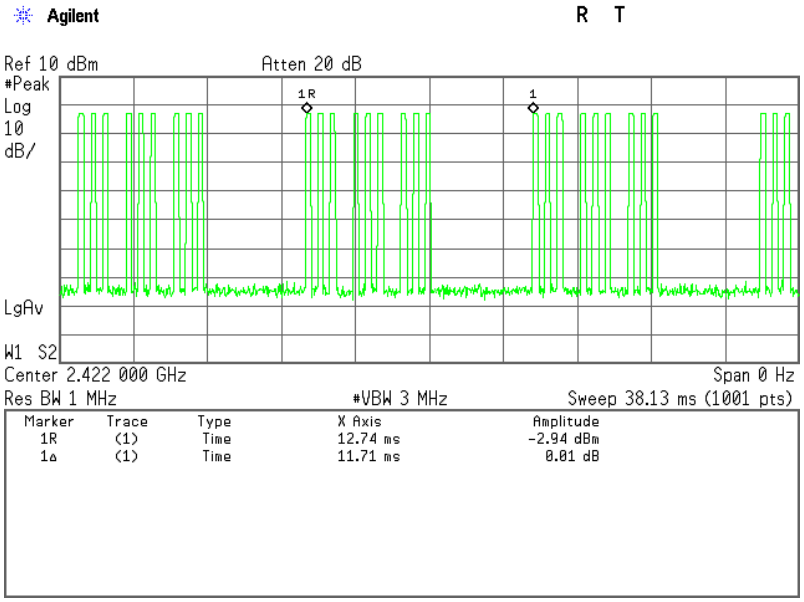
<table>
<tr><td>Test Requirement:</td><td>FCC PART 15 C section 15.249 (a), (d)
(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:
<table>
<tr><th>Fundamental Frequency (MHz)</th><th>Field Strength of Fundamental (dBmV/m @ 3m)</th><th>Field Strength of Harmonics (dBmV/m @ 3m)</th></tr>
<tr><td>902 to 928</td><td>94.0</td><td>54.0</td></tr>
<tr><td>2400 to 2483.5</td><td>94.0</td><td>54.0</td></tr>
<tr><td>5725 to 5875</td><td>94.0</td><td>54.0</td></tr>
</table>
Note: The limits shown in the above table are based on measurements using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using a CISPR quasi-peak detector.
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in§ 15.209, whichever is the lesser attenuation.</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: Clause 6.4, 6.5 and 6.6</td></tr>
<tr><td>Test Status:</td><td>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).</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Limit:</td><td>The field strength of radiated emission outside of the specified frequency bands, except for harmonics at a distance of 3 meters shall not exceed the following values:
<table>
<tr><th>Frequency (MHz)</th><th>Field Strength (dBmV/m @ 3m)</th></tr>
<tr><td>30-88</td><td>40.0</td></tr>
<tr><td>88-216</td><td>43.5</td></tr>
<tr><td>216-960</td><td>46.0</td></tr>
<tr><td>Above 960</td><td>54.0</td></tr>
</table></td></tr>
<tr><td>Detector:</td><td>For Peak and Quasi-Peak value:
200 Hz for 9 kHz to 150 kHz
9 kHz for 150 kHz to 30 MHz
120 kHz for 30 MHz to 1GHz</td></tr>
</table>

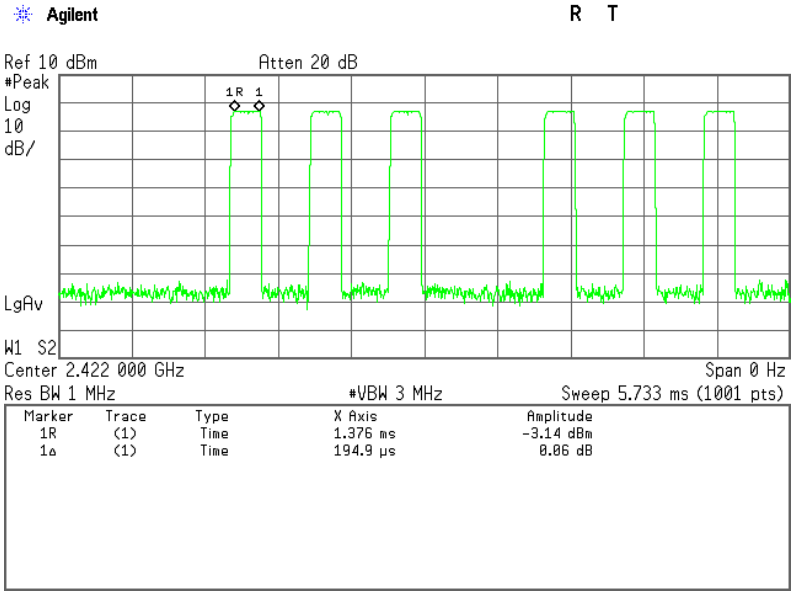
	RBW = 1 MHz for f ≥ 1 GHz VBW ≥ RBW Sweep = auto Detector function = peak for f ≥ 1 GHz, QP for f < 1 GHz Trace = max hold According 15.35(c), when the field strength (or envelope power) is not constant or it is in pulses, and an average detector is specified to be used, the value of field strength or power shall be determined by averaging over one complete pulse train, including blanking intervals within the pulse train, as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 second, 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.

The average correction factor was computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency was: Average = Peak value + 20log (Dutycycle), where the duty factor is calculated from following formula:

The duration of one cycle >100ms
Effective period of the cycle =0.195*9=1.755 ms
DC =1.755/100=0.01755 or 1.755 %
Therefore, the averaging factor is found by 20log0.01755= -35.11
The duty cycle was calculated at button, it's the worst case found.

The duration of one cycle >100ms:

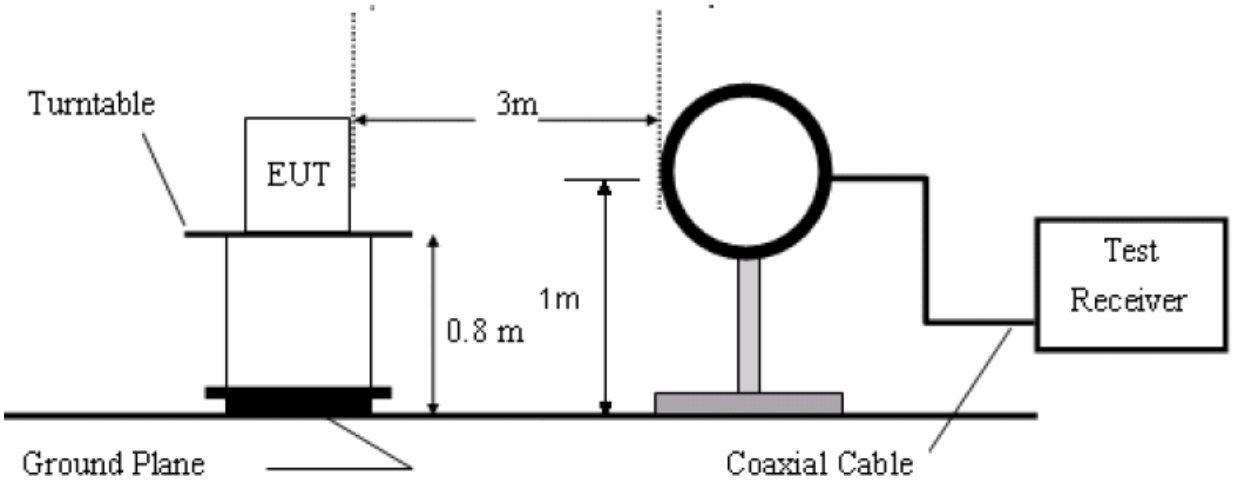




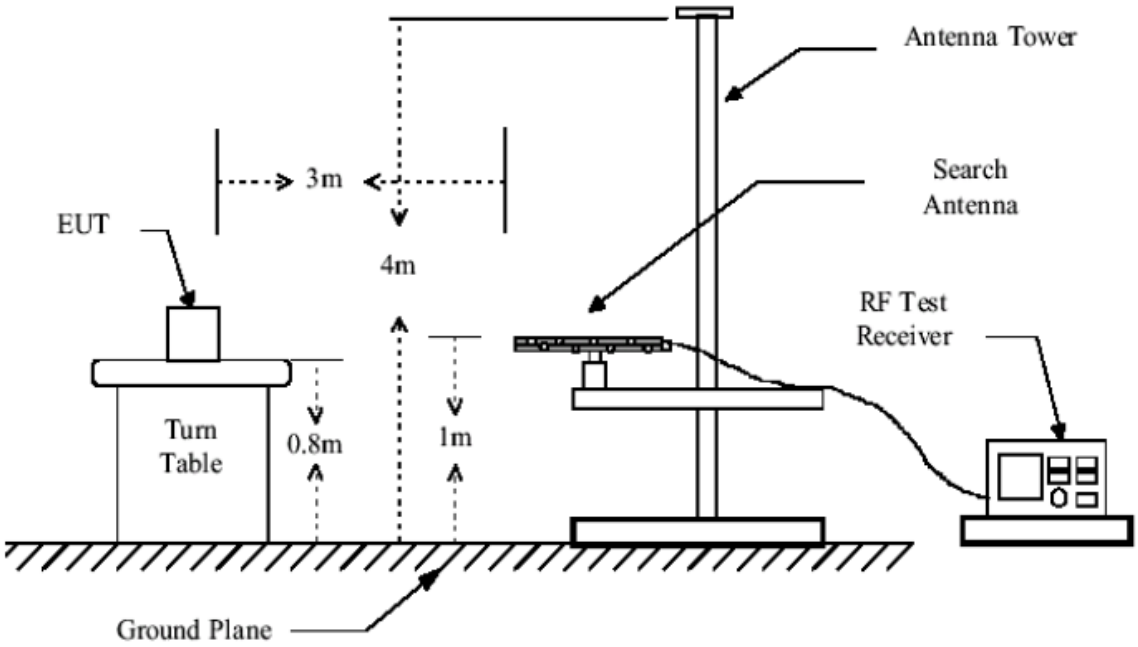
Section 15.205 Restricted bands of operation.

MHz	MHz	MHz	MHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
10.495 - 0.505	16.69475 -	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.69525	960 - 1240	7.25 - 7.75
4.125 - 4.128	16.80425 -	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	16.80475	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	25.5 - 25.67	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	37.5 - 38.25	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	73 - 74.6	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	74.8 - 75.2	2200 - 2300	14.47 - 14.5
8.291 - 8.294	108 - 121.94	2310 - 2390	15.35 - 16.2
8.362 - 8.366	123 - 138	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	149.9 - 150.05	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.52475 -	3260 - 3267	23.6 - 24.0
12.29 - 12.293	156.52525	3332 - 3339	31.2 - 31.8
12.51975 -	156.7 - 156.9	3345.8 - 3358	36.43 - 36.5
12.52025	162.0125 - 167.17	3600 - 4400	
12.57675 -	167.72 - 173.2		
12.57725	240 - 285		
13.36 - 13.41	322 - 335.4		

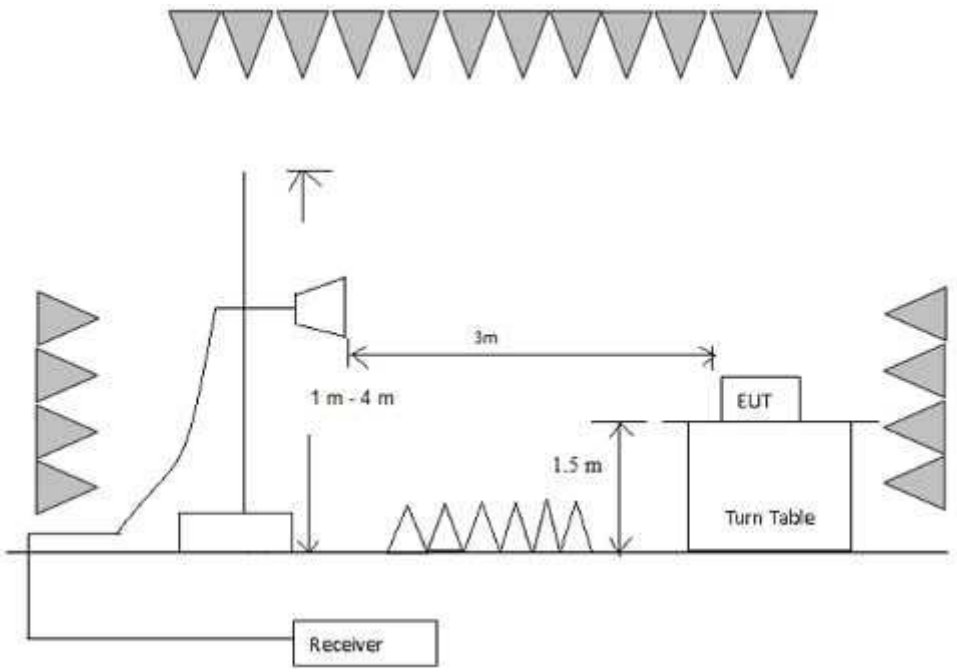
Test Configuration:
1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



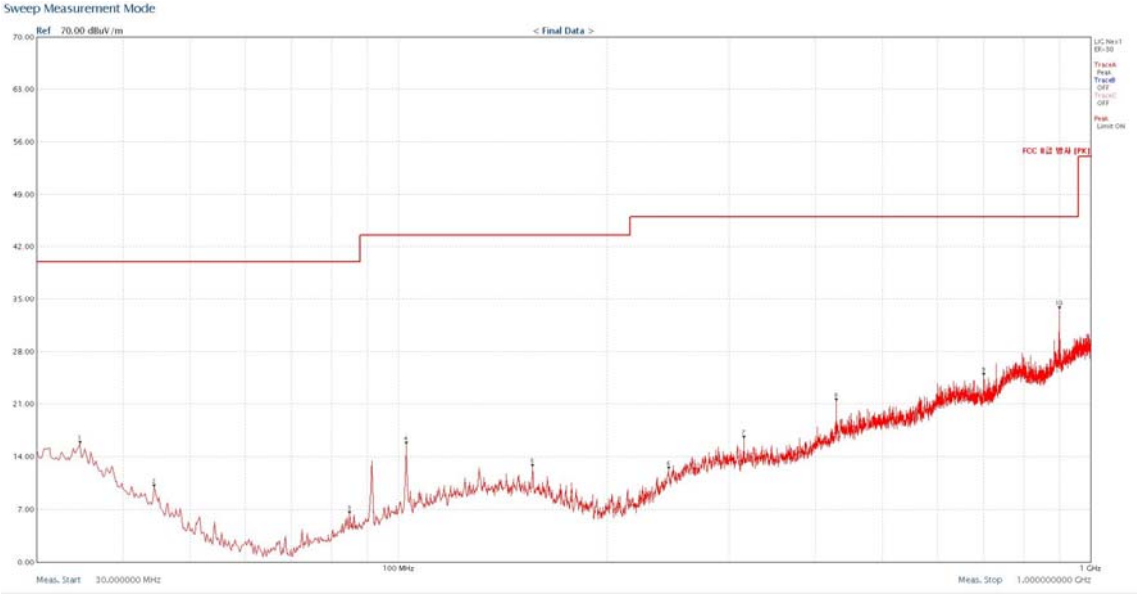
Test Procedure:
1) 9 kHz to 30 MHz emissions:
For testing performed with the loop antenna. The centre of the loop was positioned 1 m above the ground and positioned with its plane vertical at the special distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.
2) 30 MHz to 1 GHz emissions:
For testing performed with the bi-log type antenna. The measurement is performed with the EUT rotated 360ɨ, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.
3) 1 GHz to 25 GHz emissions:
Test site with RF absorbing material covering the ground plane that met the site validation criterion called out in CISPR 16-1-4:2010 was used to perform radiated emission test above 1GHz. For testing performed with the horn antenna. The measurement is performed with the EUT rotated 360ɨ, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.
4) The receiver was scanned from 9 kHz to 25 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal

rated supply voltage. The worst case emissions were reported.

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Radiated Emissions (Below 1GHz)

Test Curve and test data
Horizontal:

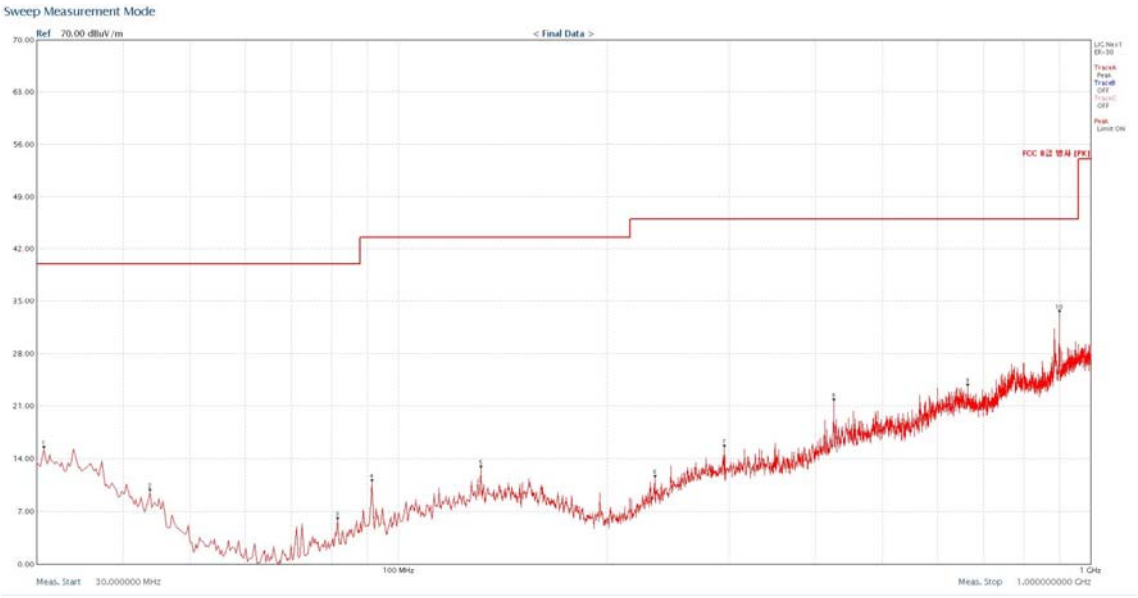


Quasi-peak measurement:

Frequency (MHz)	Receiver Reading Level (dBmV)	Correction factors (dB/m)	Emission Level (dBmV/m)	Limit (dBmV/m)
35.006	13.94	17.97	31.91	40.0
102.304	19.59	11.30	30.89	43.5
126.454	14.78	12.52	27.30	43.5
317.181	14.54	16.16	30.70	46.0
479.973	17.95	21.00	38.95	46.0

Remark:
Final Test Level =Receiver Reading + Correction Factor
Correction Factor = Antenna Factor + Cable Loss.

Vertical:



Quasi-peak measurement:

Frequency (MHz)	Receiver Reading Level (dBmV)	Correction factors (dB/m)	Emission Level (dBmV/m)	Limit (dBmV/m)
33.315	14.14	17.95	32.09	40.0
91.299	14.16	10.40	24.56	43.5
129.905	9.94	12.47	22.41	43.5
313.859	9.67	16.06	25.73	46.0

Remark:
Final Test Level =Receiver Reading + Correction Factor
Correction Factor = Antenna Factor + Cable Loss.

Radiated Emissions (Above 1GHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Correction Factor (dB)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)

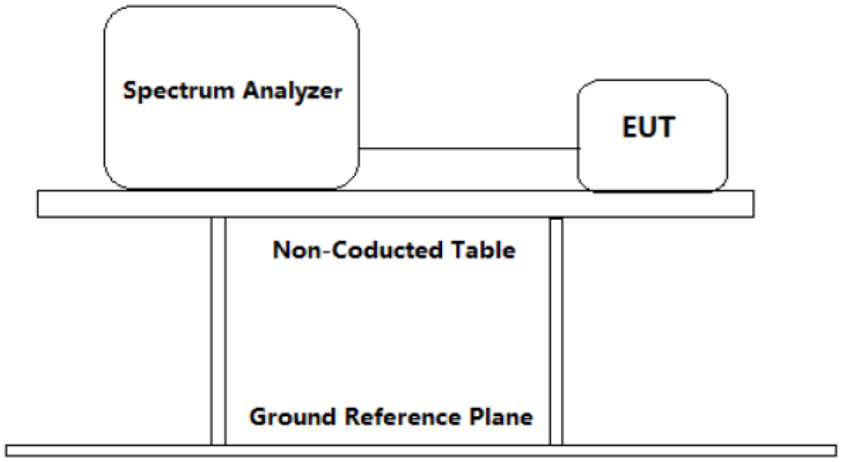
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

Notes:
1. AT frequencies equal to or less than 1000MHz, quasi-peak detector was used, above 1000MHz, Peak detector was used.
2. All measurements were made at 3 meter.
3. Horn antenna is used for the emission over 1000MHz.
4. Final Test Level =Receiver Reading + Correction Factor
Correction Factor = Antenna Factor + Cable Loss –Preamplifier Factor.
5. Final Test Level (AV) =PK + Average Factor
6. When Peak emission level was below AV limit, the AV emission level did not be recorded.

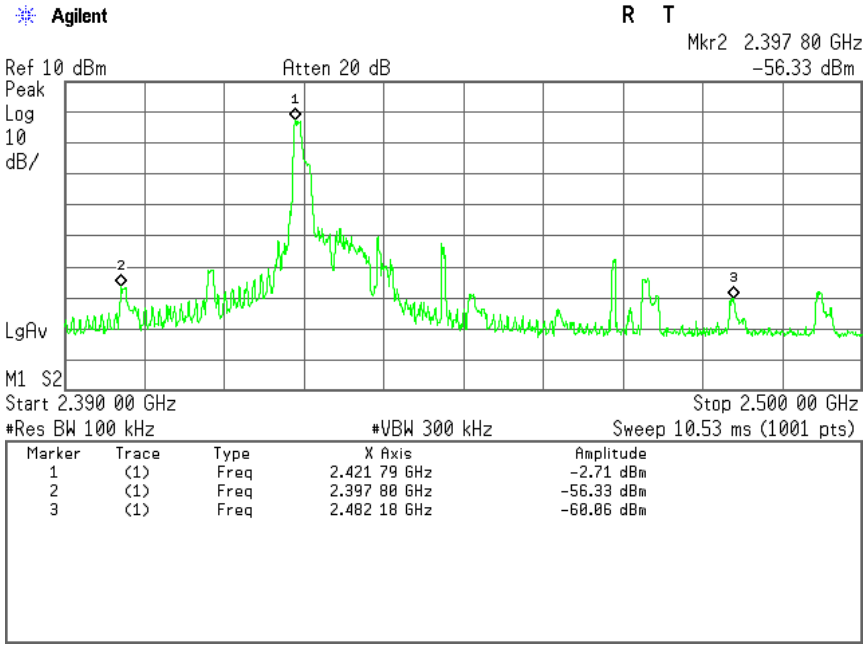
5.4. Band Edges Requirement

Test Requirement:	FCC PART 15 C section 15.249 (d) (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.
Frequency Band:	2400 MHz to 2483.5 MHz
Test Method:	ANSI C63.10: Clause 6.10
Test Status:	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).

Test Configuration:



Result plot as follows:



Peak Measurement
Band-edge compliance is determined by applying marker-delta method, i.e (Band-edge Plot).

(i) Lower band-edge:
Peak Resultant field strength
=Fundamental emissions (peak value) – delta from the band-edge plot
= 104.3 dBμv/m – 53.62 dB
= 50.68 dBμv/m

(ii) Upper band-edge:
Peak Resultant field strength
=Fundamental emissions (peak value) – delta from the band-edge plot
= 104.3 dBμv/m – 57.35 dB
= 46.95 dBμv/m

The Peak resultant field strength meets the general radiated emission AV limit 54dBμv/m, so it complies with the requirement.

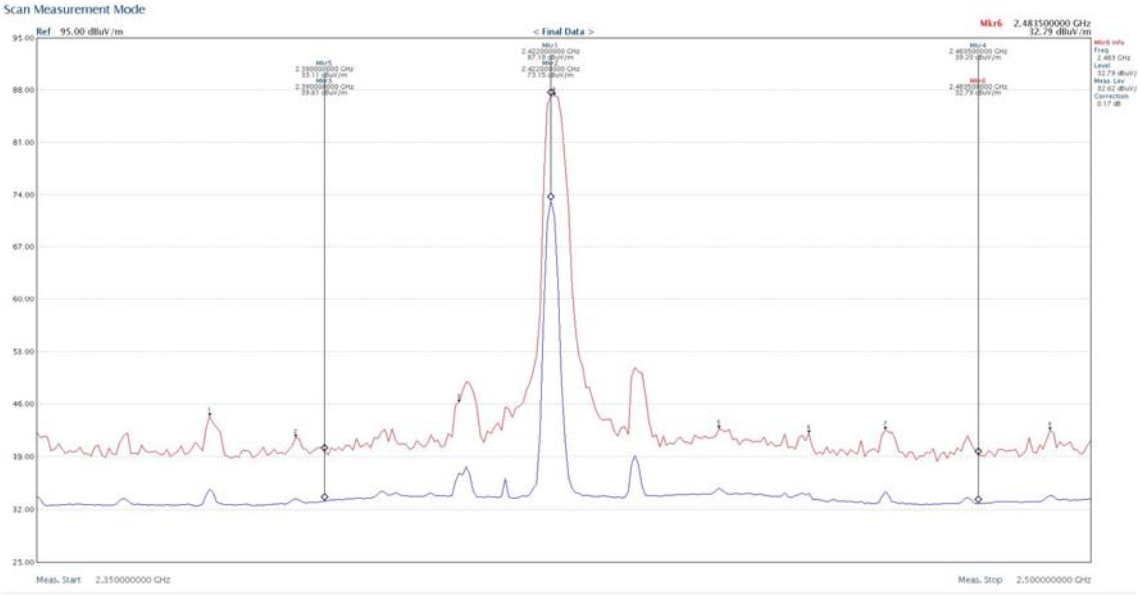
5.5. Fundametal Emissions(Radiated emissions)

Radiated EMI tests were performed inside a fully compliant CISPR16-1-4 semi-anechoic chamber. The EUT was positioned on a test table of height 0.8 meter. The EUT was rotated through 360° on the turntable and the highest emissions were maximised by scanning the measurement antenna over the height

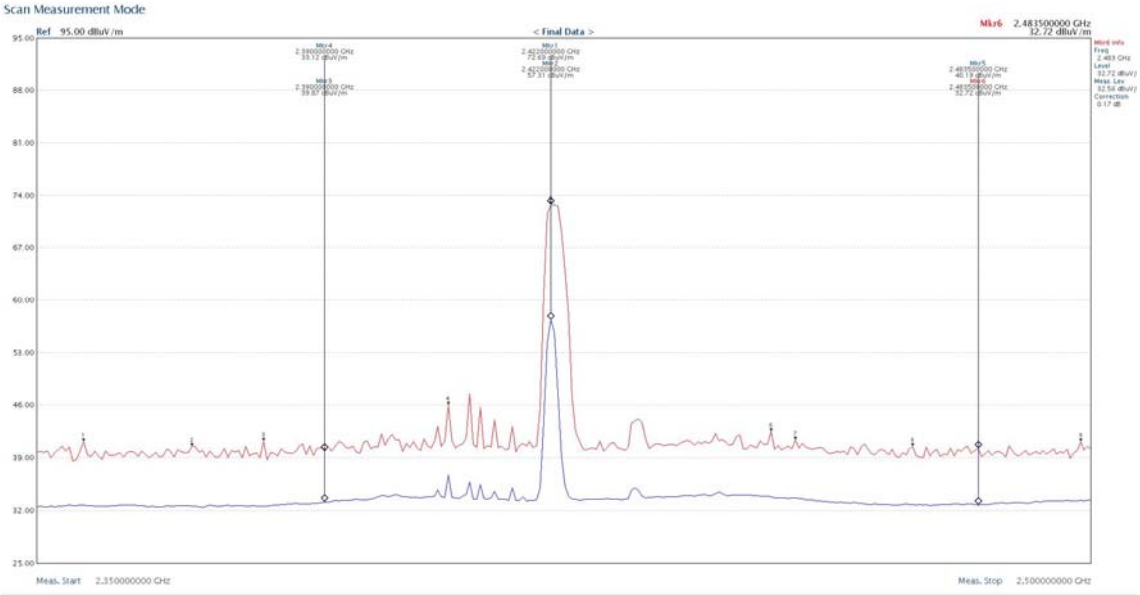
Fundametal

Channel	Frequency	E(Peak) dBμN/m	Limit(peak) dBμN/m	Result
1	2422	72.69	94	Pass

horizontal



Vertical


Scan Measurement Mode
Ref 95.00 dBuV/m
< Final Data >
Mkr6 2.483500000 GHz
32.72 dBuV/m
95.00
88.00
81.00
74.00
67.00
60.00
53.00
46.00
39.00
32.00
25.00
Meas. Start 2.350000000 GHz
Meas. Stop 2.500000000 GHz

APPENDIX

1. EUT photo