



Test report No:
2040637R-RF-US-P06V02

FCC TEST REPORT & ISED TEST REPORT

Product Name	Tunable White Direct Connect Smart Bulb
Trademark	GE
Model and /or type reference	CLEDR309SD1
FCC ID	PUU-BR30-DMTW
IC ID	10798A-DMTWBR30
Applicant's name / address	GE Lighting 1975 Noble Road, Cleveland, Ohio, United States
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C Section 15.247 ANSI C63.10: 2013 KD558074 D01 15.247 Meas Guidance v05r02 RSS-Gen Issue 5 / RSS-247 Issue 2
Verdict Summary	IN COMPLIANCE
Documented By	Kitty Li/Project Assistant 
Reviewed by (name / position & signature)	Frank He/ Technical Supervisor 
Approved by (name / position & signature)	Jack Zhang/ Supervisor 
Date of issue	2020-07-02
Report template No	2040637R-RF-US-P06V02

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COMPETENCES AND GUARANTEES

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In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Apr. 25, 2020
Date (start test)	Apr. 28, 2020
Date (finish test)	May.16, 2020

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
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ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2040637R-RF-US-P06V02	V1.0	Initial issue of report.	2020-06-10
2040637R-RF-US-P06V02	V1.1	Update the standard name of Chapter 4.1.4.	2020-06-23
2040637R-RF-US-P06V02	V1.2	Update some descriptions.	2020-07-02

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart C Paragraph 15.247, RSS-Gen Issue 5, RSS-247 Issue 2.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result, unless the specification, standard or customer have special requirements.
4. The test results presented in this report relate only to the object tested.
5. The test results relate only to the samples tested.
6. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
7. This report will not be used for social proof function in China market.

USED EQUIPMENT

AC Power Line Conducted Emission / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMI Test Receiver	R&S	ESCI	100906	2020.04.20	2021.04.19
Two-Line V-Network	R&S	ENV216	101190	2019.05.25	2020.05.24
Two-Line V-Network	R&S	ENV216	101044	2019.05.25	2020.05.24
Current Probe	R&S	EZ-17	100678	2020.03.12	2021.04.11
50ohm Termination	SHX	TF2	07081402	2019.09.02	2020.09.01
50ohm Termination	SHX	TF2	07081403	2019.09.02	2020.09.01
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A	N/A
Temperature/Humidity Meter	RTS	RTS-8S	TR1-TH	2019.08.21	2020.08.20
Coaxial Cable	Suhner	RG 223	TR1-C1	2019.08.25	2020.08.24
Coaxial Cable	Suhner	RG 223	TR1-C2	2019.08.25	2020.08.24
Dekra test software	Dekra	-	-	-	-

Emissions in non-restricted frequency bands/ Occupied Bandwidth/ Fundamental emission output power Power Spectral Density / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2019.09.28	2020.09.27
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.17	2021.04.16
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2019.08.30	2020.08.29
Wideband Peak Power Meter	Anritsu	ML2495A	0905006	2019.07.14	2020.07.13
Power Sensor	Anritsu	MA2411B	0846014	2019.08.12	2020.08.11
Coaxial Cable	Woken	SFL402	F02-150410-044	2020.01.01	2020.12.31
Dekra test software	Dekra	-	-	-	-

Radiated Emission(30MHz-1GHz) / AC3

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMI Test Receiver	R&S	ESCI	100573	2020.03.03	2021.03.02
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2019.05.25	2020.05.24
Temperature/Humidity Meter	RTS	RTS-8S	AC2-TH	2019.09.02	2020.09.01
Coaxial Cable	Huber+Suhner	RG 214	AC2-C	2020.04.13	2021.04.12
Dekra test software	Dekra	-	-	-	-

Radiated Emission / AC5(1GHz-40GHz)(Chamber details)

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	E4446A	MY45300103	2020.05.08	2021.05.07
Preamplifier	Miteq	NSP1800-25	1364185	2020.05.06	2021.05.05
Preamplifier	QuieTek	AP-040G	CHM-0906001	2020.05.06	2021.05.05
DRG Horn	ETS-Lindgren	3117	00123988	2020.01.22	2021.01.21
Temperature/Humidity Meter	Zhichen	ZC1-2	AC5-TH	2019.09.02	2020.09.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2020.04.13	2021.04.12
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2020.04.13	2021.04.12
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2020.04.13	2021.04.12
Dekra test software	Dekra	-	-	-	-

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%

Test item	Uncertainty
AC Power Line Conducted Emission	9kHz~150kHz: 2.80dB 150kHz~30MHz: 2.40dB
Peak Power Output	± 1.27 dB
Radiated Emission(30MHz~1GHz)	Horizontal: 30MHz~200MHz: 3.50 dB 300MHz~1GHz: 3.60 dB Vertical: 30MHz~200MHz: 3.60 dB 300MHz~1GHz: 3.50 dB
Radiated Emission(1GHz~26.5GHz)	Horizontal: 1GHz~18GHz: 5.00 dB Vertical: 1GHz~18GHz: 4.80 dB
RF antenna conducted test	± 1.27 dB
Radiated Emission Band Edge	± 3.9 dB
DTS Bandwidth	± 150 Hz
Occupied Bandwidth	± 1 kHz
Power Density	± 1.27 dB

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name	Tunable White Direct Connect Smart Bulb
Model No.	CLEDR309SD1
Trademark	GE
FCC ID	PUU-BR30-DMTW
IC ID	10798A-DMTWBR30
Manufacturer	GE Lighting.
Manufacturer Address	1975 Noble Road, Cleveland, Ohio, United States

Wireless specification.....	Bluetooth 4.2
Operating frequency range(s)	2400~2483.5MHz
Type of Modulation.....	GFSK
Number of channel.....	40
Operating Temperature Range	-40°C - 105 °C

Rated power supply	Voltage and Frequency	
	<input type="checkbox"/>	AC: 220 – 240 V, 50/60 Hz
	<input checked="" type="checkbox"/>	AC: 100 – 240 V, 50/60 Hz
	<input type="checkbox"/>	DC: 15~24Vdc
	<input type="checkbox"/>	Battery: 3.7V
Mounting position	<input type="checkbox"/>	Table top equipment
	<input checked="" type="checkbox"/>	Wall/Ceiling mounted equipment
	<input type="checkbox"/>	Floor standing equipment
	<input type="checkbox"/>	Hand-held equipment
	<input type="checkbox"/>	Other: Wearable equipment

1.2 Antenna Information

Antenna model / type number	PIFA antenna		
Antenna serial number	N/A		
Antenna Delivery	<input checked="" type="checkbox"/>	1TX + 1RX	
	<input type="checkbox"/>	2TX + 2RX	
Antenna technology	<input checked="" type="checkbox"/>	SISO	
	<input type="checkbox"/>	MIMO	<input type="checkbox"/> CDD <input type="checkbox"/> Beam-forming
Antenna Type	<input type="checkbox"/>	External	<input type="checkbox"/> Dipole <input type="checkbox"/> Sectorized
	<input checked="" type="checkbox"/>	Internal	<input type="checkbox"/> PIFA
			<input type="checkbox"/> PCB
			<input checked="" type="checkbox"/> Metal Monopole Antenna
			<input type="checkbox"/> Others.....
Antenna Gain	0.88 dBi		

1.3 Channel List

Bluetooth Working Frequency of Each Channel: (For V4.2)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	01	2404 MHz	02	2406 MHz	03	2408 MHz
04	2410 MHz	05	2412 MHz	06	2414 MHz	07	2416 MHz
08	2418 MHz	09	2420 MHz	10	2422 MHz	11	2424 MHz
12	2426 MHz	13	2428 MHz	14	2430 MHz	15	2432 MHz
16	2434 MHz	17	2436 MHz	18	2438 MHz	19	2440 MHz
20	2442 MHz	21	2444 MHz	22	2446 MHz	23	2448 MHz
24	2450 MHz	25	2452 MHz	26	2454 MHz	27	2456 MHz
28	2458 MHz	29	2460 MHz	30	2462 MHz	31	2464 MHz
32	2466 MHz	33	2468 MHz	34	2470 MHz	35	2472 MHz
36	2474 MHz	37	2476 MHz	38	2478 MHz	39	2480 MHz

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

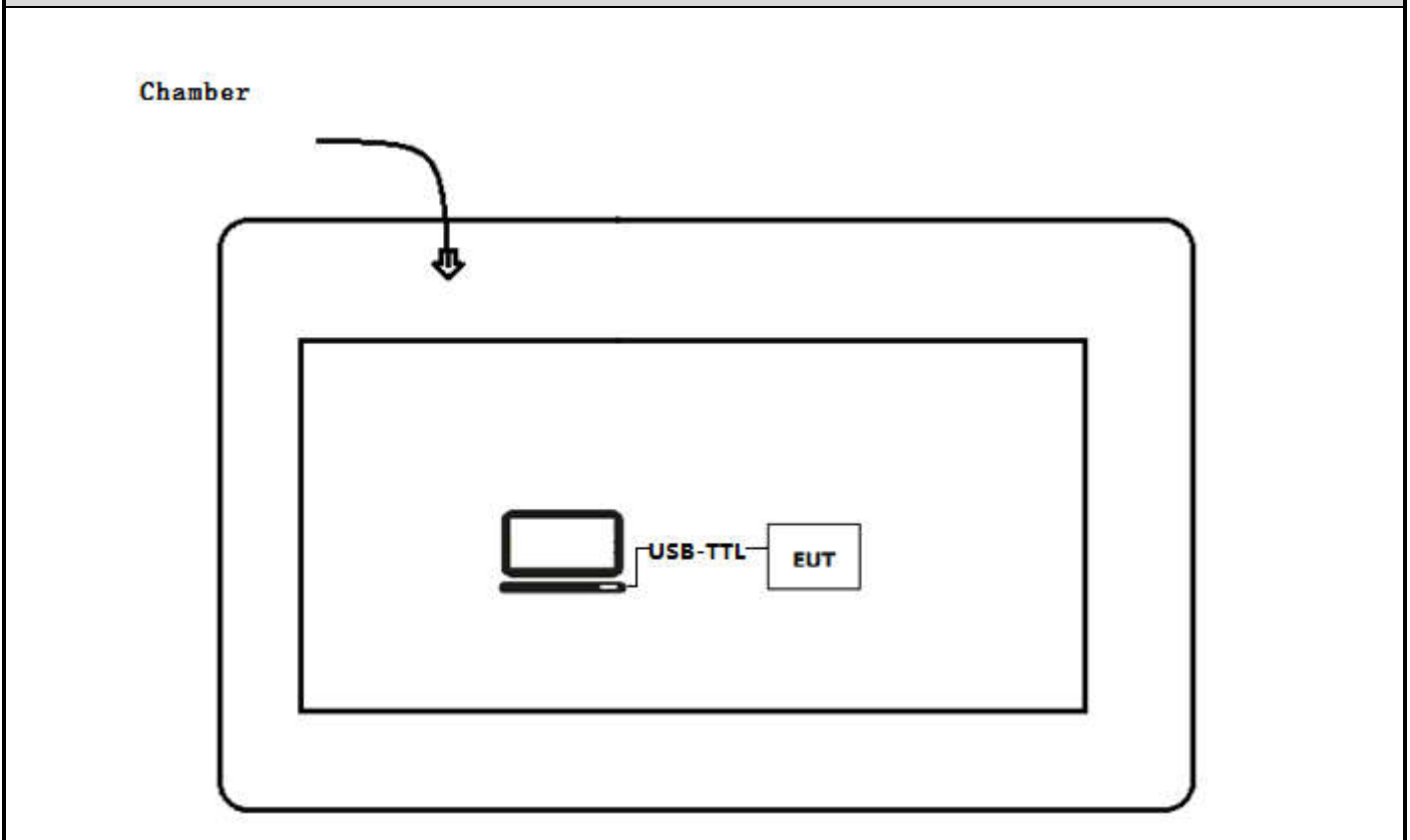
Test Mode For Bluetooth	Mode 1: Transmit by LE_1Mbps(GFSK_LE)
	Mode 2: Normal Operation

2.2 Auxiliary equipment / Test software for the EUT

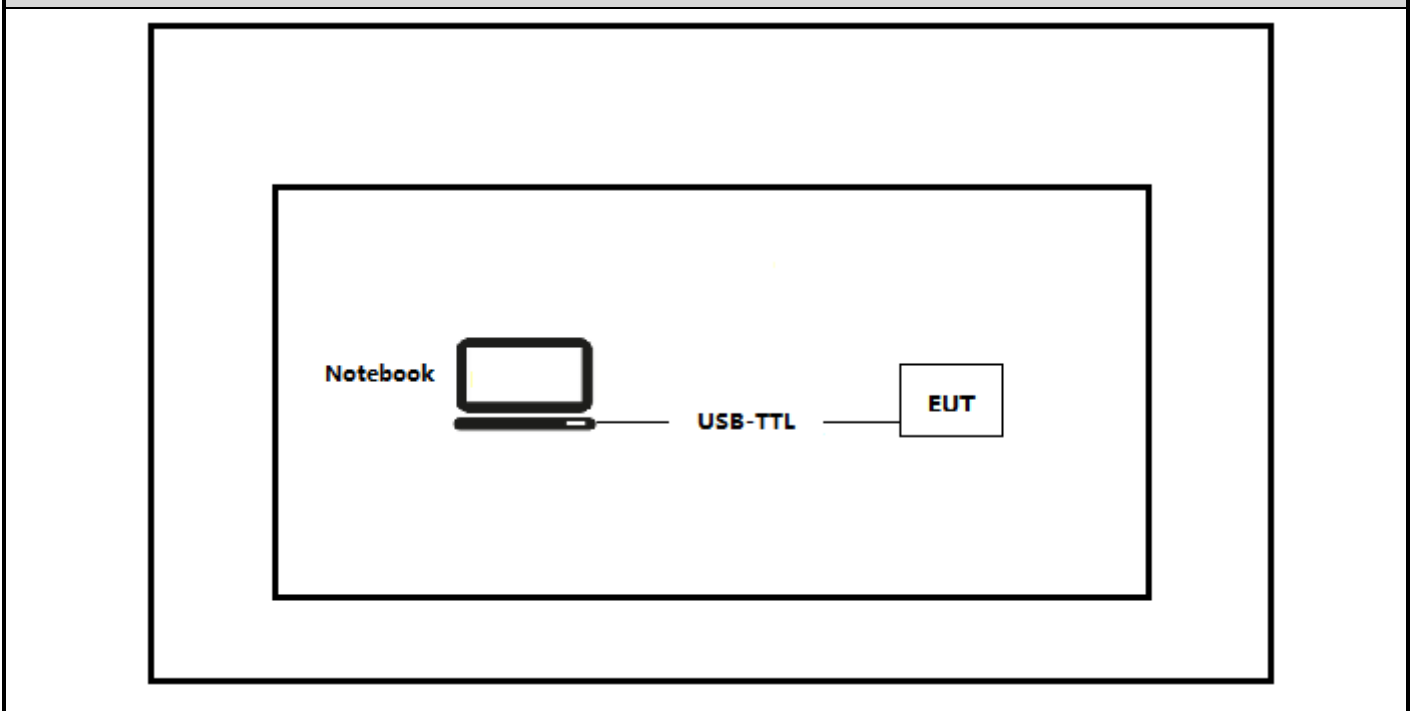
Auxiliary equipment	Type / Version	Manufacturer	Supplied by
Notebook	E470	Lenovo	N/A
software	Type / Version	Manufacturer	Supplied by
HueApprobationTool	1.1.00	GE	N/A

2.3 Test Configuration / Block diagram used for tests

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Conducted test



2.4 Testing process

1	Setup the EUT as shown in Section 2.4.
2	Execute the nRFgo Studio on the EUT
3	Configure the test mode, the test channel, and the data rate.
4	Press "Start Test" to start the continuous Transmitter.
5	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 15 Subpart C Section 15.247	2019	Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074 D01 v05r02	2019	Guidance for performing compliance measurements on Digital Transmission System (DTS) operating under section 15.247
RSS-Gen Issue 5 Amendment 1	2019	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2	2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

The following deviation(s) was / were made from the published requirements of the listed standards: N/A.

(Please define the deviations from the standard(s) if applicable)

3.3 Overview of results

For FCC

Requirement – Test case	Basic standard(s)	Verdict	Remark
AC Power Line Conducted Emission	FCC 15.207	PASS	---
Emissions in restricted frequency bands	FCC 15.247(b)(3)	PASS	---
Duty cycle	ANSI C63.10:2013	PASS	---
Emissions in non-restricted frequency bands	FCC 15.247(d), FCC 15.209	PASS	---
Radiated Emission Band Edge	FCC 15.247(d)	PASS	---
Fundamental emission output power	FCC 15.247(d), FCC 15.209	PASS	---
DTS Bandwidth	FCC 15.247(a)(2)	PASS	---
Power Spectral Density	FCC 15.247(e)	PASS	---
Antenna Requirement	FCC 15.203	PASS	---

For ISED

Requirement – Test case	Basic standard(s)	Verdict	Remark
AC Power Line Conducted Emission	RSS-Gen Issue 5 Section 8.8	PASS	---
Emissions in restricted frequency bands	RSS-Gen Issue 5 Section 8.9	PASS	---
Duty cycle	ANSI C63.10:2013	PASS	---
Emissions in non-restricted frequency bands	RSS-247 Issue 2 Section 5.5	PASS	---
Radiated Emission Band Edge	RSS-Gen Issue 5 Section 8.10	PASS	---
Fundamental emission output power	RSS-247 Issue 2 Section 5.4(d)	PASS	---
DTS Bandwidth	RSS-Gen Issue 5 Section 6.7	PASS	---
Power Spectral Density	RSS-247 Issue 2 Section 5.2(b)	PASS	---
Antenna Requirement	RSS-Gen Issue 5 Section 6.8	PASS	---

3.4 Test Facility

USA	:	FCC Designation Number: CN1199
CA	:	ISED CAB identifier: CN0040

4 TEST RESULTS

4.1 AC Power Line Conducted Emission

VERDICT: PASS

4.1.1 Limit

Standard		FCC Part 15 Subpart C Paragraph 15.207	
Frequency range [MHz]	Limit: QP [dB(μV) ¹⁾	Limit: AV [dB(μV) ¹⁾	
0,15 - 0,50	66 - 56 ²⁾	56 - 46 ²⁾	
0,50 - 5,0	56	46	
5,0 - 30	60	50	

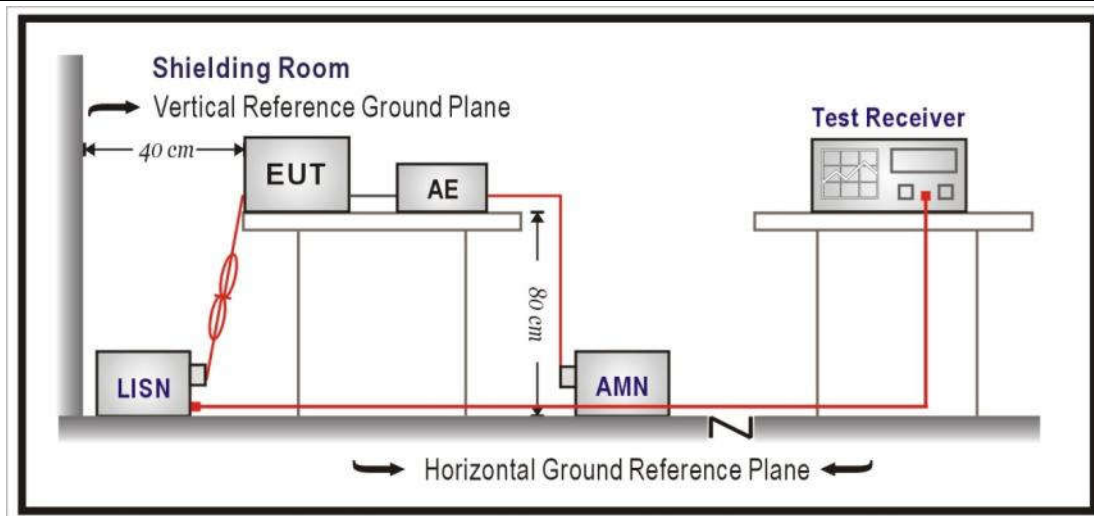
¹⁾ At the transition frequency, the lower limit applies.

²⁾ The limit decreases linearly with the logarithm of the frequency.

NOTE 1: The exclusion band for transmitters shall be considered for transmitters operating at frequencies below 30 MHz.

NOTE 2: Where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT the AC power output port need not to be tested.

4.1.2 Test Setup

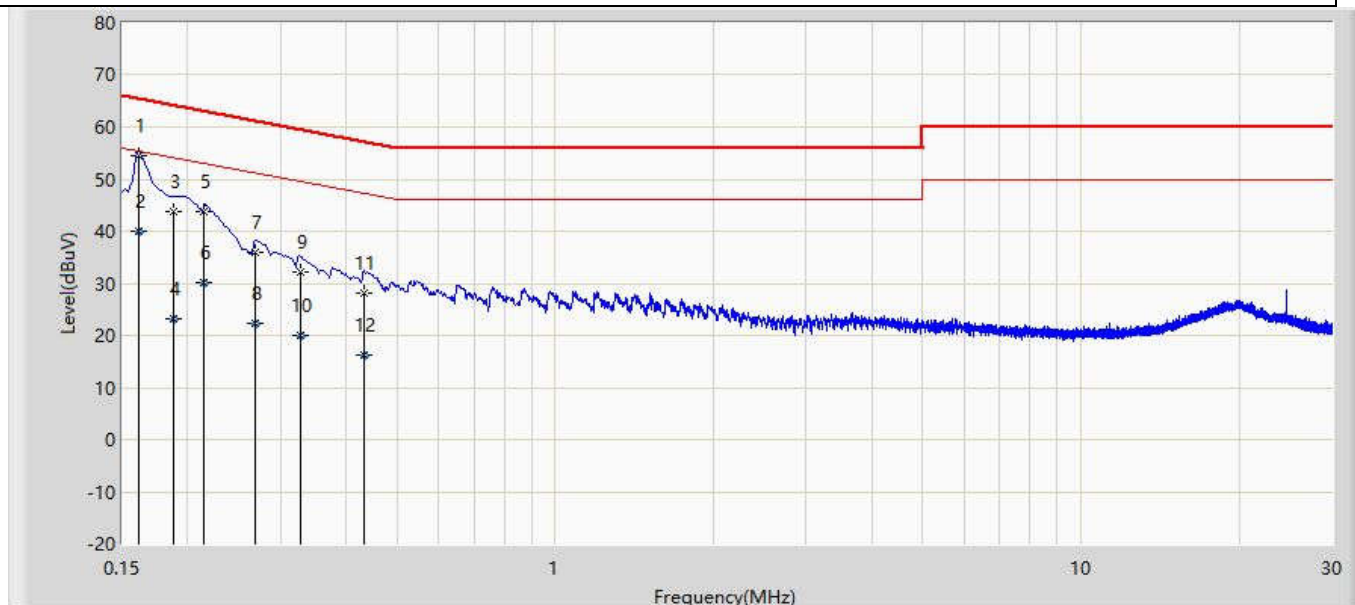


4.1.3 Test Procedure

References Rule	Chapter	Item
<input checked="" type="checkbox"/> ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.1.4 Test Data

Profile: 2040637R	Page No.: 1
Engineer: Tian	
Site: TR1	Time: 2020/04/24
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101190(0.009-30MHz)	Polarity: Neutral
EUT: Tunable White Direct Connect Smart Bulb	Power: AC 120V/60Hz
Note: Mode 1	

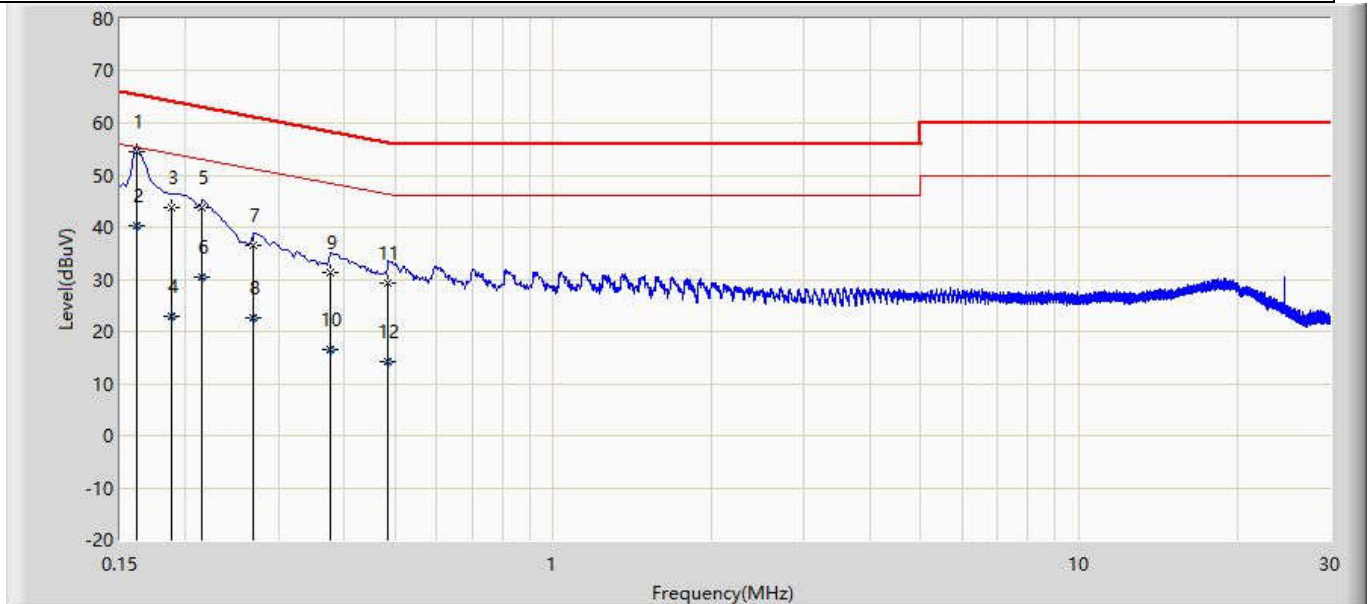


No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1	*	0.161	54.361	44.740	-11.038	65.399	9.592	0.029	0.000	QP
2		0.161	39.976	30.355	-15.423	55.399	9.592	0.029	0.000	AV
3		0.188	43.905	34.279	-20.208	64.113	9.598	0.028	0.000	QP
4		0.188	23.068	13.442	-31.046	54.113	9.598	0.028	0.000	AV
5		0.215	43.707	34.079	-19.293	63.000	9.599	0.029	0.000	QP
6		0.215	30.195	20.567	-22.806	53.000	9.599	0.029	0.000	AV
7		0.269	35.840	26.210	-25.301	61.141	9.597	0.033	0.000	QP
8		0.269	22.360	12.730	-28.781	51.141	9.597	0.033	0.000	AV
9		0.328	32.082	22.452	-27.426	59.508	9.595	0.035	0.000	QP
10		0.328	19.903	10.273	-29.605	49.508	9.595	0.035	0.000	AV
11		0.433	28.125	18.493	-29.060	57.185	9.592	0.040	0.000	QP
12		0.433	16.366	6.735	-30.819	47.185	9.592	0.040	0.000	AV

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Profile: 2040637R	Page No.: 2
Engineer: Tian	
Site: TR1	Time: 2020/04/24
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101190(0.009-30MHz)	Polarity: Line
EUT: Tunable White Direct Connect Smart Bulb	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1	*	0.161	54.507	44.870	-10.893	65.399	9.608	0.029	0.000	QP
2		0.161	40.198	30.562	-15.201	55.399	9.608	0.029	0.000	AV
3		0.188	43.815	34.184	-20.299	64.113	9.602	0.028	0.000	QP
4		0.188	22.969	13.338	-31.145	54.113	9.602	0.028	0.000	AV
5		0.215	43.763	34.134	-19.237	63.000	9.600	0.029	0.000	QP
6		0.215	30.332	20.702	-22.668	53.000	9.600	0.029	0.000	AV
7		0.269	36.590	26.957	-24.551	61.141	9.600	0.033	0.000	QP
8		0.269	22.534	12.901	-28.607	51.141	9.600	0.033	0.000	AV
9		0.377	31.449	21.812	-26.890	58.340	9.600	0.037	0.000	QP
10		0.377	16.481	6.843	-31.859	48.340	9.600	0.037	0.000	AV
11		0.485	29.186	19.544	-27.063	56.249	9.600	0.042	0.000	QP
12		0.485	14.087	4.445	-32.162	46.249	9.600	0.042	0.000	AV

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

4.2 Emissions in restricted frequency bands

VERDICT: PASS

4.2.1 Limit

Standard		FCC Part 15 Subpart C Paragraph 15.207	
Restricted Bands of operation			
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (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
8.81425 – 8.81475	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			
Restricted Bands of operation for IC			
0.090 - 0.110	13.36 - 13.41	960 - 1427	9.0 - 9.2
0.495 - 0.505	16.42 - 16.423	1435 - 1626.5	9.3 - 9.5
2.1735 - 2.1905	16.69475 - 16.69525	1645.5 - 1646.5	10.6 - 12.7
3.020 - 3.026	16.80425 - 16.80475	1660 - 1710	13.25 - 13.4
4.125 - 4.128	25.5 - 25.67	1718.8 - 1722.2	14.47 - 14.5
4.17725 - 4.17775	37.5 - 38.25	2200 - 2300	15.35 - 16.2
4.20725 - 4.20775	73 - 74.6	2310 - 2390	17.7 - 21.4
5.677 - 5.683	74.8 - 75.2	2483.5 - 2500	22.01 - 23.12
6.215 - 6.218	108 - 138	2655 - 2900	23.6 - 24.0
6.26775 - 6.26825	149.9 - 150.05	3260 - 3267	31.2 - 31.8
6.31175 - 6.31225	156.52475 - 156.52525	3332 - 3339	36.43 - 36.5
8.291 - 8.294	156.7 - 156.9	3345.8 - 3358	Above 38.6
8.362 - 8.366	162.0125 - 167.17	3500 - 4400	
8.37625 - 8.38675	167.72 - 173.2	4500 - 5150	
8.41425 - 8.41475	240 - 285	5350 - 5460	
12.29 - 12.293	322 - 335.4	7250 - 7750	
12.51975 - 12.52025	399.9 - 410	8025 - 8500	
12.57675 - 12.57725	608 - 614	--	

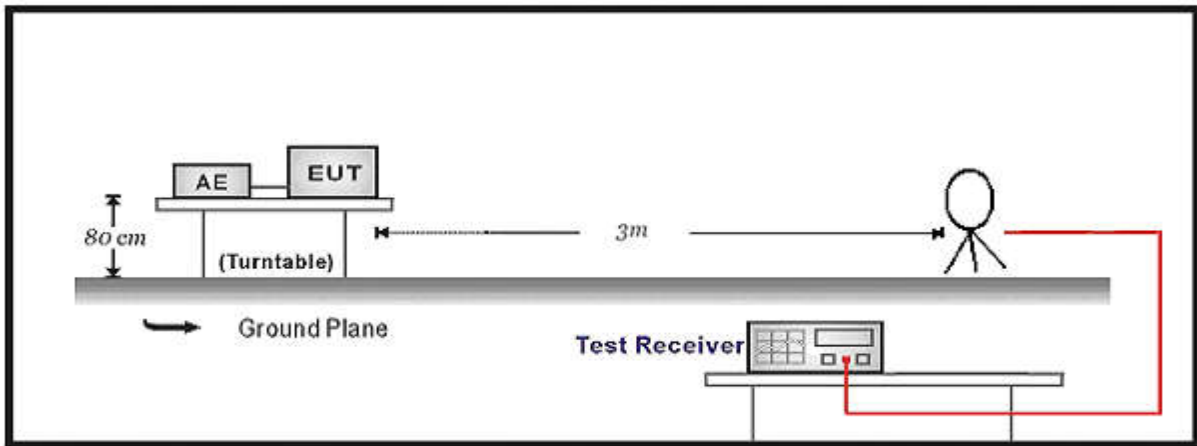
Restricted Band Emissions Limit			
Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300 _(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30 _(Note 1)
1.705 - 30	30	29.5	30 _(Note 1)
30 - 88	100	40	3 _(Note 2)
88 - 216	150	43.5	3 _(Note 2)
216 - 960	200	46	3 _(Note 2)
Above 960	500	54	3 _(Note 2)

Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

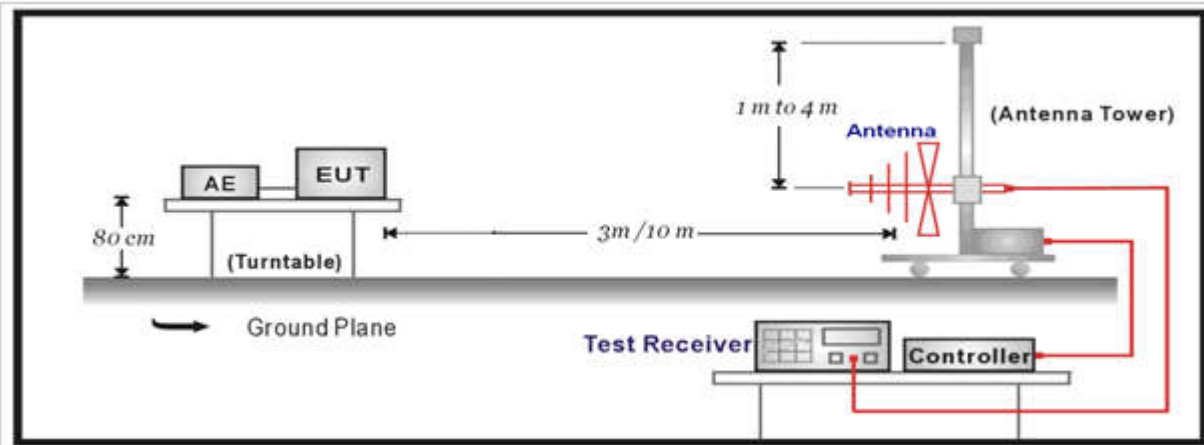
Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.2.2 Test Setup

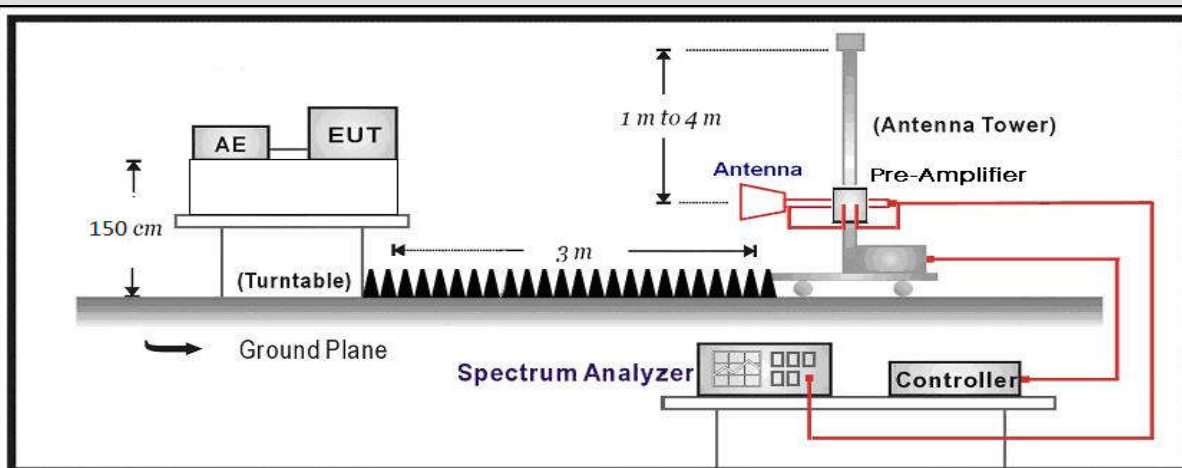
Below 30MHz Test Setup:



30MHz-1GHz Test Setup:



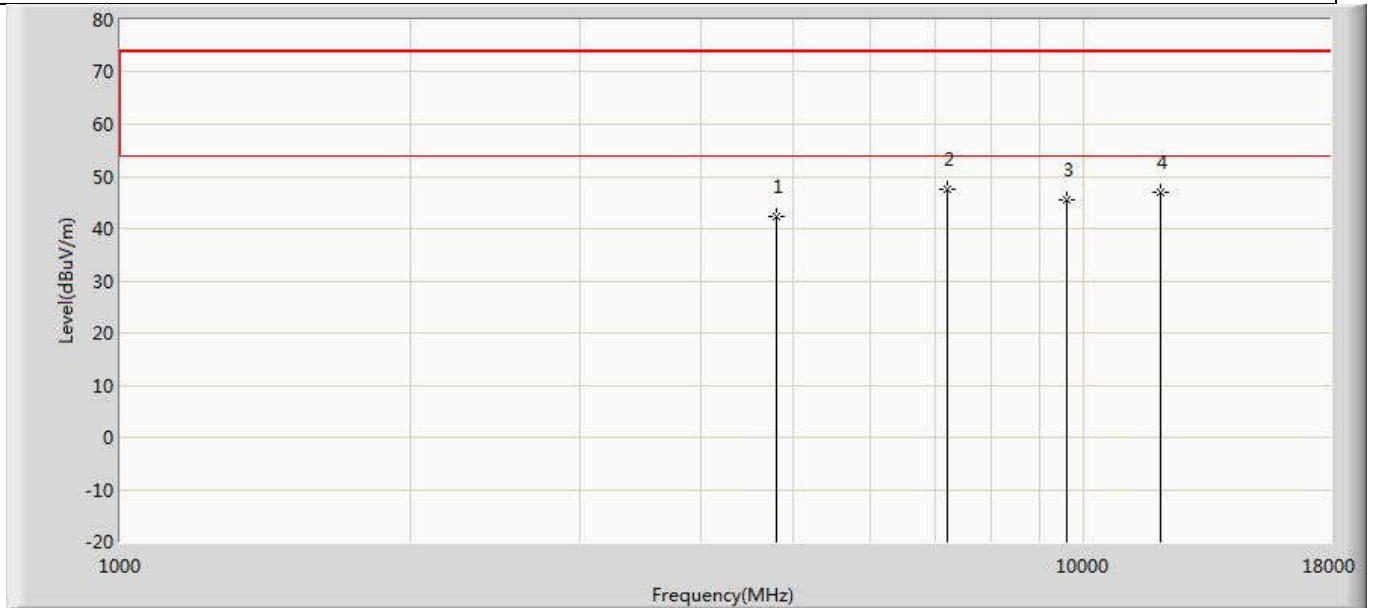
Above 1GHz Test Setup:



4.2.3 Test Procedure			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10	11.12	Emissions in restricted frequency bands
	<input checked="" type="checkbox"/> ANSI C63.10	11.12.1	Radiated emission measurements
	<input checked="" type="checkbox"/> ANSI C63.10	11.12.2.7	Radiated spurious emission test
	<input checked="" type="checkbox"/> ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
	<input checked="" type="checkbox"/> ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
	<input checked="" type="checkbox"/> ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

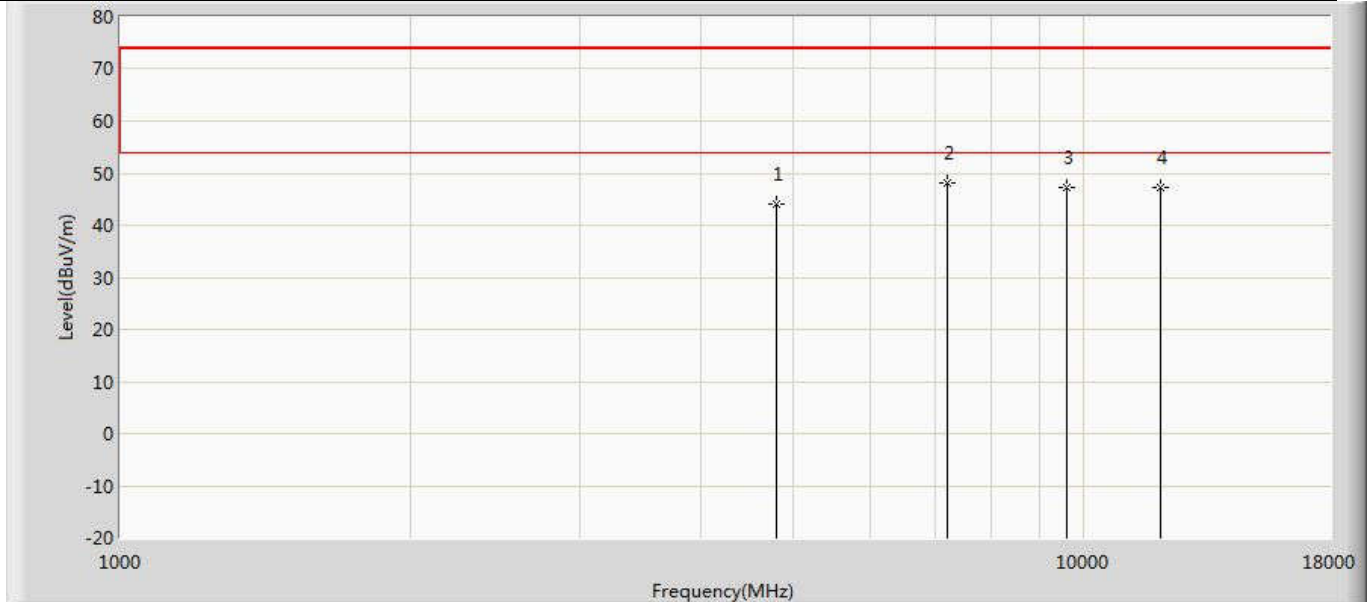
4.2.4 Test Data

Profile: 2040637R	Page No.: 15
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:58
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



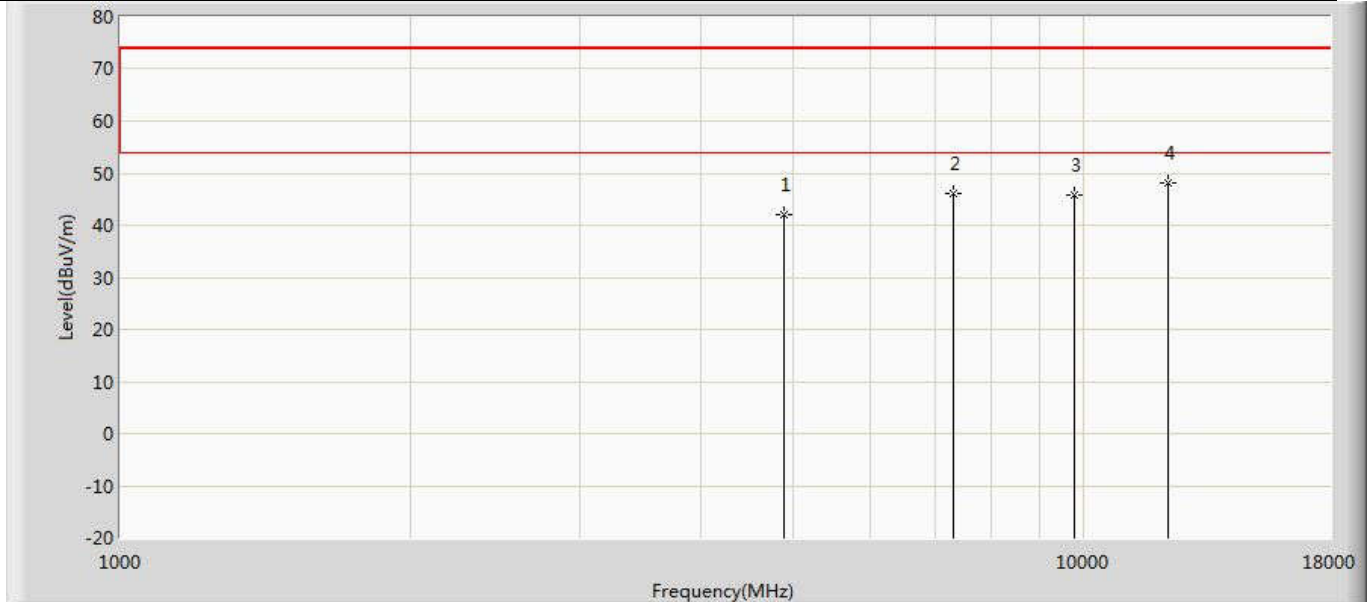
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4804.000	42.408	38.747	-31.592	74.000	3.662	PK
2	*	7206.000	47.629	40.966	-26.371	74.000	6.663	PK
3		9608.000	45.596	37.460	-28.404	74.000	8.137	PK
4		12010.000	46.827	34.037	-27.173	74.000	12.789	PK

Profile: 2040637R	Page No.: 16
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:58
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



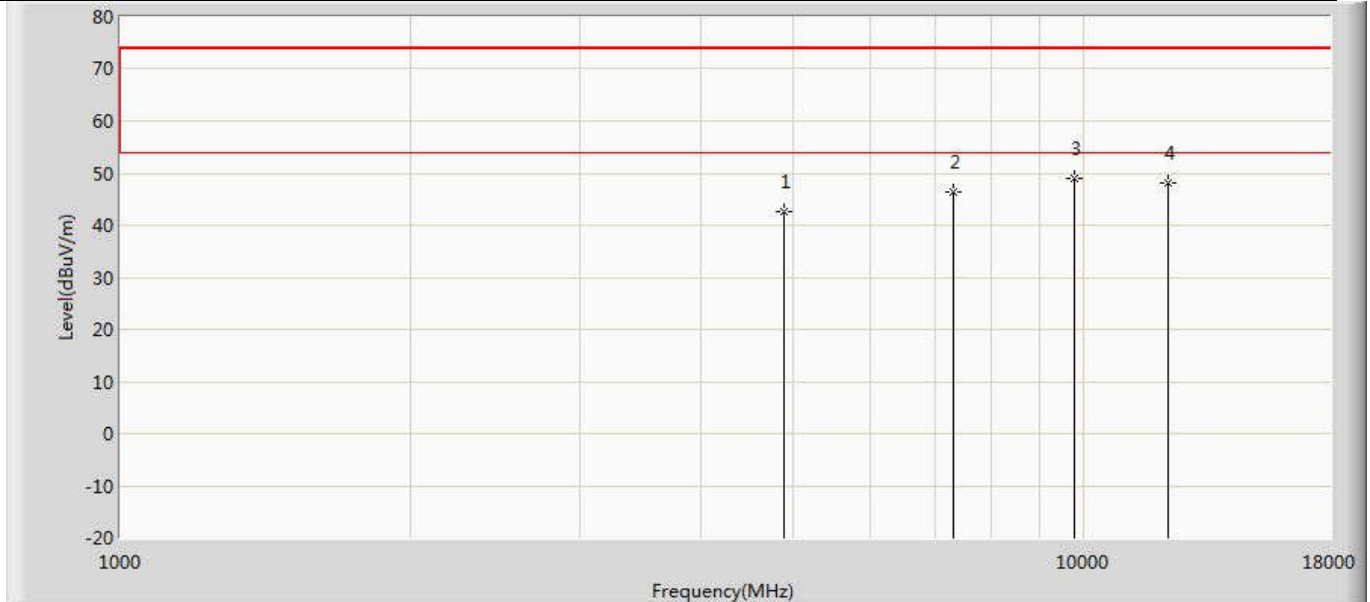
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4804.000	44.092	40.431	-29.908	74.000	3.662	PK
2	*	7206.000	48.166	41.503	-25.834	74.000	6.663	PK
3		9608.000	47.242	39.106	-26.758	74.000	8.137	PK
4		12010.000	47.217	34.427	-26.783	74.000	12.789	PK

Profile: 2040637R	Page No.: 17
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:58
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2442MHz by BLE	



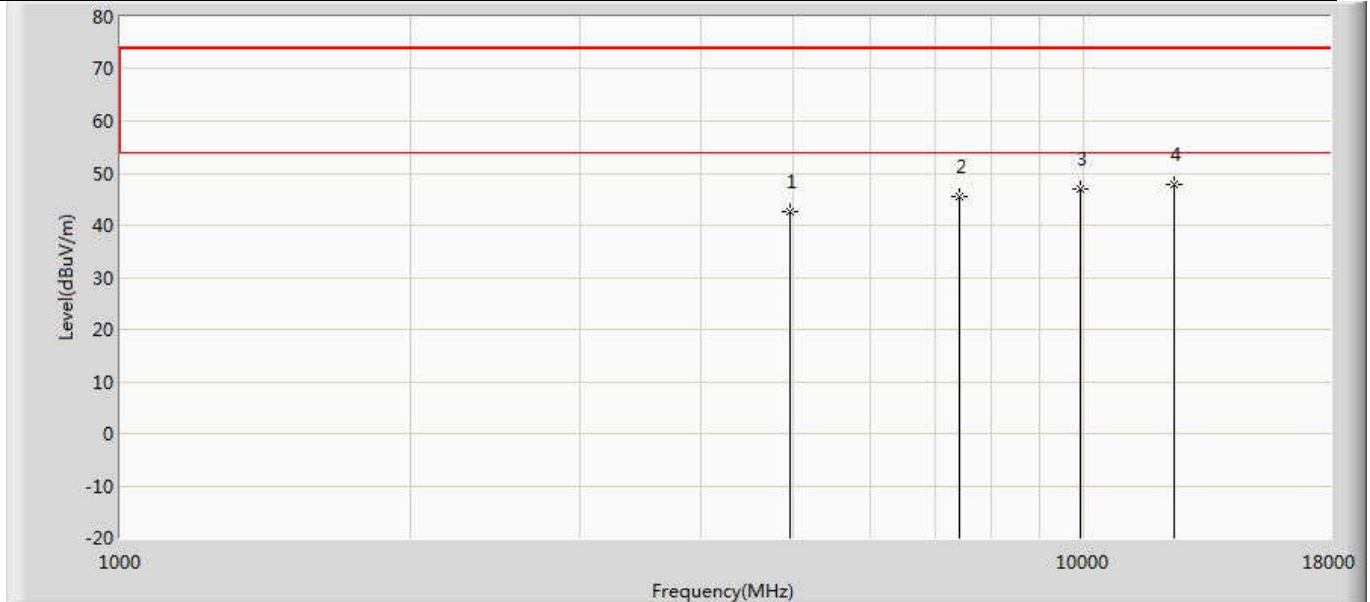
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4884.000	42.099	38.503	-31.901	74.000	3.596	PK
2		7326.000	46.217	39.529	-27.783	74.000	6.687	PK
3		9768.000	45.778	36.947	-28.222	74.000	8.832	PK
4	*	12210.000	48.118	34.578	-25.882	74.000	13.540	PK

Profile: 2040637R	Page No.: 18
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:58
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2442MHz by BLE	



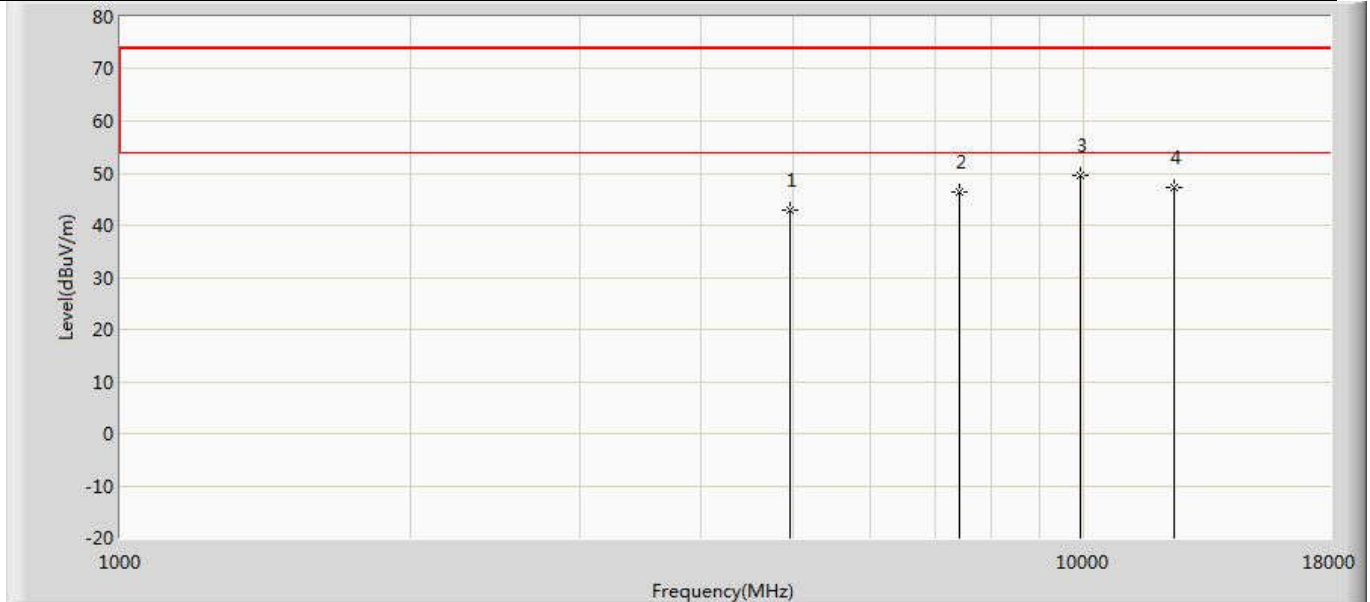
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4884.000	42.638	39.042	-31.362	74.000	3.596	PK
2		7326.000	46.338	39.650	-27.662	74.000	6.687	PK
3	*	9768.000	48.878	40.047	-25.122	74.000	8.832	PK
4		12210.000	48.108	34.568	-25.892	74.000	13.540	PK

Profile: 2040637R	Page No.: 19
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:58
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



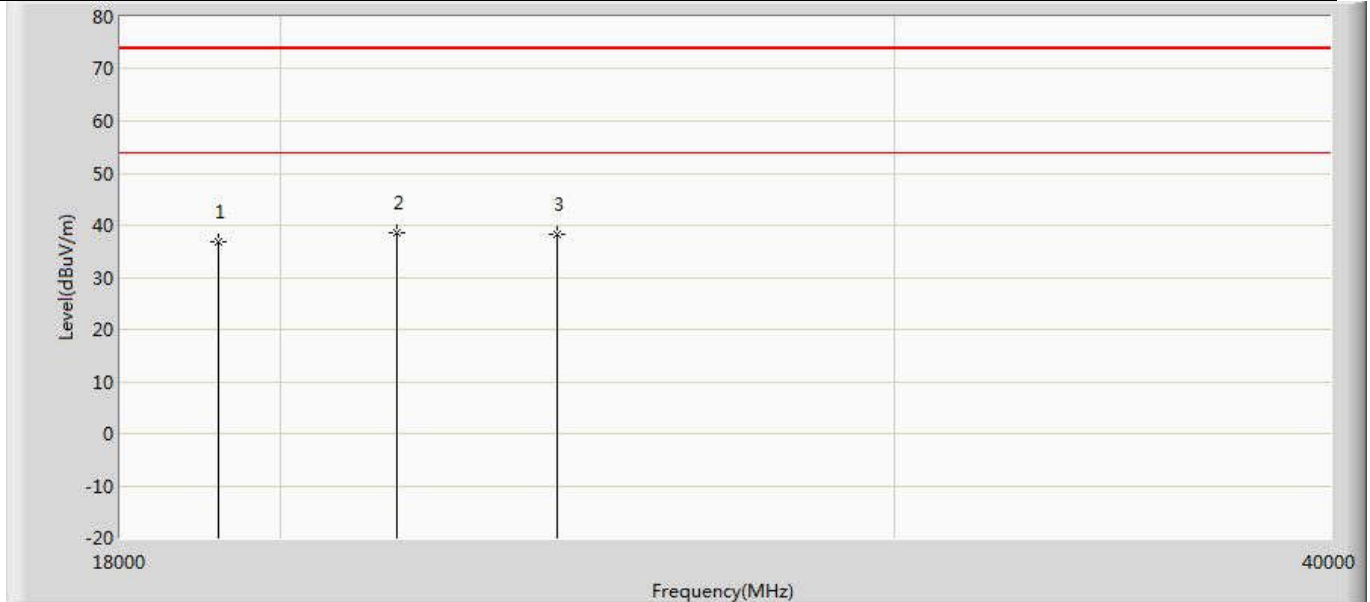
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4960.000	42.661	39.050	-31.339	74.000	3.611	PK
2		7440.000	45.535	38.950	-28.465	74.000	6.585	PK
3		9920.000	46.996	38.271	-27.004	74.000	8.725	PK
4	*	12400.000	47.801	33.825	-26.199	74.000	13.976	PK

Profile: 2040637R	Page No.: 20
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:59
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



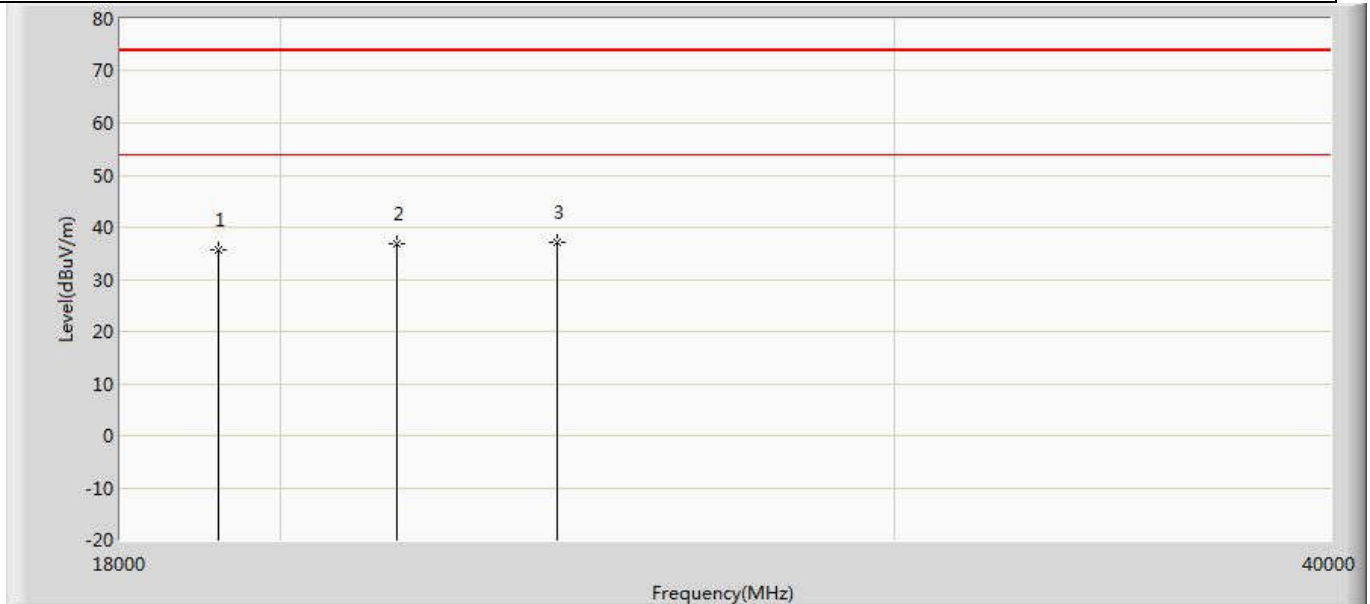
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4960.000	42.789	39.178	-31.211	74.000	3.611	PK
2		7440.000	46.294	39.709	-27.706	74.000	6.585	PK
3	*	9920.000	49.514	40.789	-24.486	74.000	8.725	PK
4		12400.000	47.335	33.359	-26.665	74.000	13.976	PK

Profile: 2040637R	Page No.: 27
Engineer: YULIU	
Site: AC5	Time: 2020/05/06 - 20:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA 9170_294(18-40GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



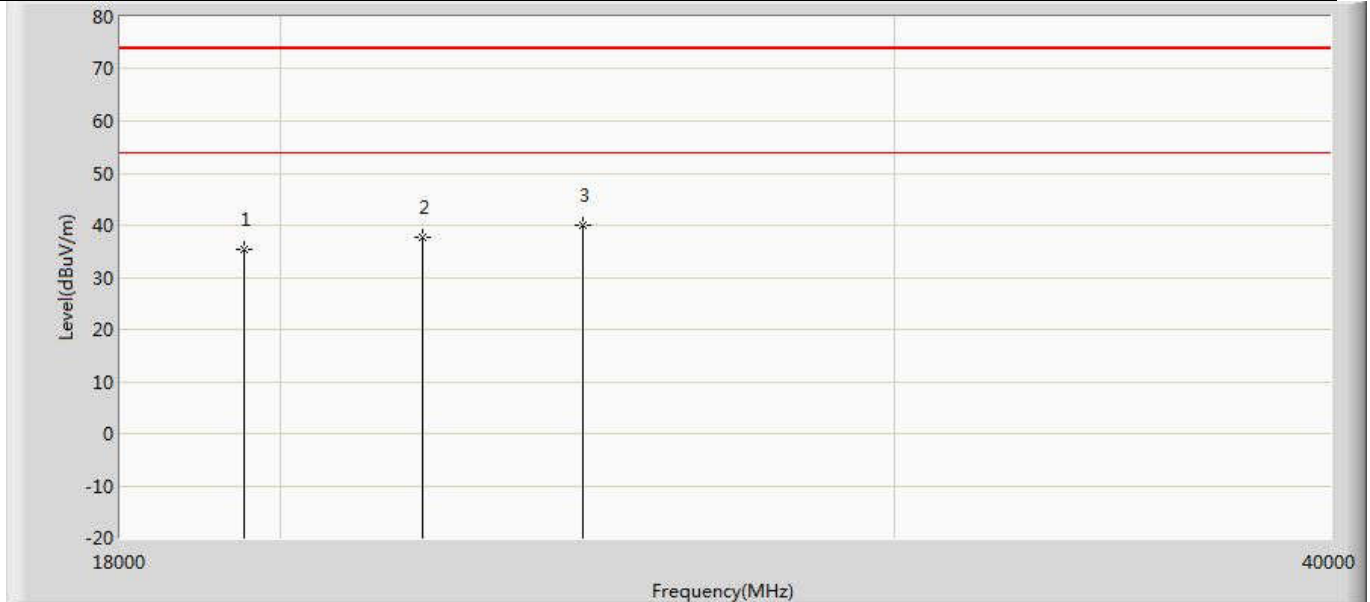
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		19216.000	36.765	33.339	-37.235	74.000	3.426	PK
2	*	21618.000	38.652	33.926	-35.348	74.000	4.725	PK
3		24020.000	38.379	33.023	-35.621	74.000	5.356	PK

Profile: 2040637R	Page No.: 28
Engineer: YULIU	
Site: AC5	Time: 2020/05/06 - 20:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA 9170_294(18-40GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



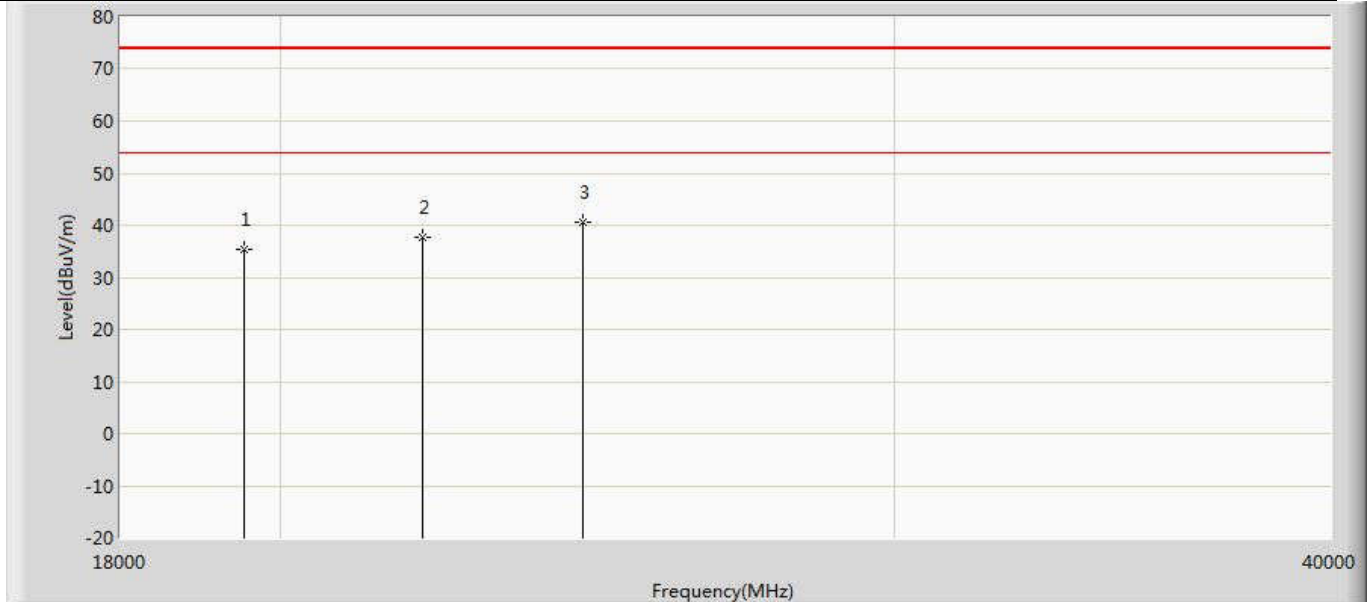
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		19216.000	35.595	32.169	-38.405	74.000	3.426	PK
2		21618.000	36.725	31.999	-37.275	74.000	4.725	PK
3	*	24020.000	37.225	31.869	-36.775	74.000	5.356	PK

Profile: 2040637R	Page No.: 29
Engineer: YULIU	
Site: AC5	Time: 2020/05/06 - 20:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA 9170_294(18-40GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2442MHz by BLE	



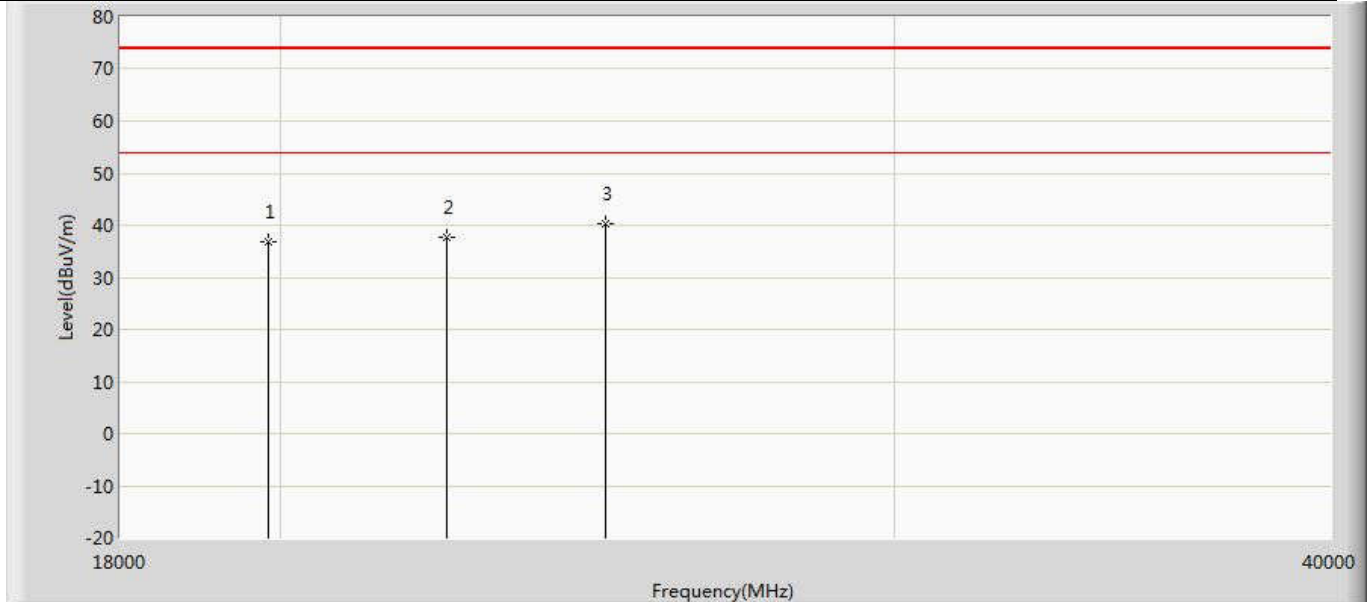
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		19536.000	35.462	31.863	-38.538	74.000	3.599	PK
2		21978.000	37.788	32.768	-36.212	74.000	5.020	PK
3	*	24420.000	40.073	34.356	-33.927	74.000	5.716	PK

Profile: 2040637R	Page No.: 30
Engineer: YULIU	
Site: AC5	Time: 2020/05/06 - 20:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA 9170_294(18-40GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2442MHz by BLE	



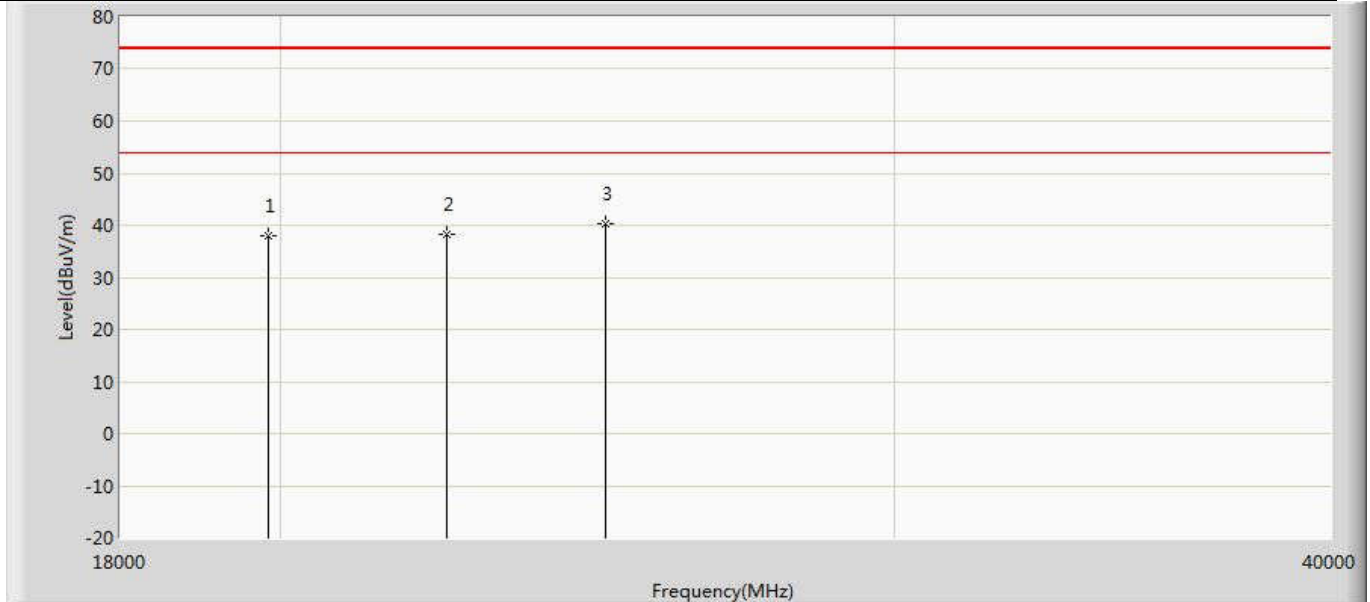
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		19536.000	35.230	31.631	-38.770	74.000	3.599	PK
2		21978.000	37.687	32.667	-36.313	74.000	5.020	PK
3	*	24420.000	40.677	34.960	-33.323	74.000	5.716	PK

Profile: 2040637R	Page No.: 31
Engineer: YULIU	
Site: AC5	Time: 2020/05/06 - 20:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA 9170_294(18-40GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		19840.000	36.779	32.925	-37.221	74.000	3.853	PK
2		22320.000	37.811	32.882	-36.189	74.000	4.929	PK
3	*	24800.000	40.183	34.581	-33.817	74.000	5.602	PK

Profile: 2040637R	Page No.: 32
Engineer: YULIU	
Site: AC5	Time: 2020/05/06 - 20:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: BBHA 9170_294(18-40GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	

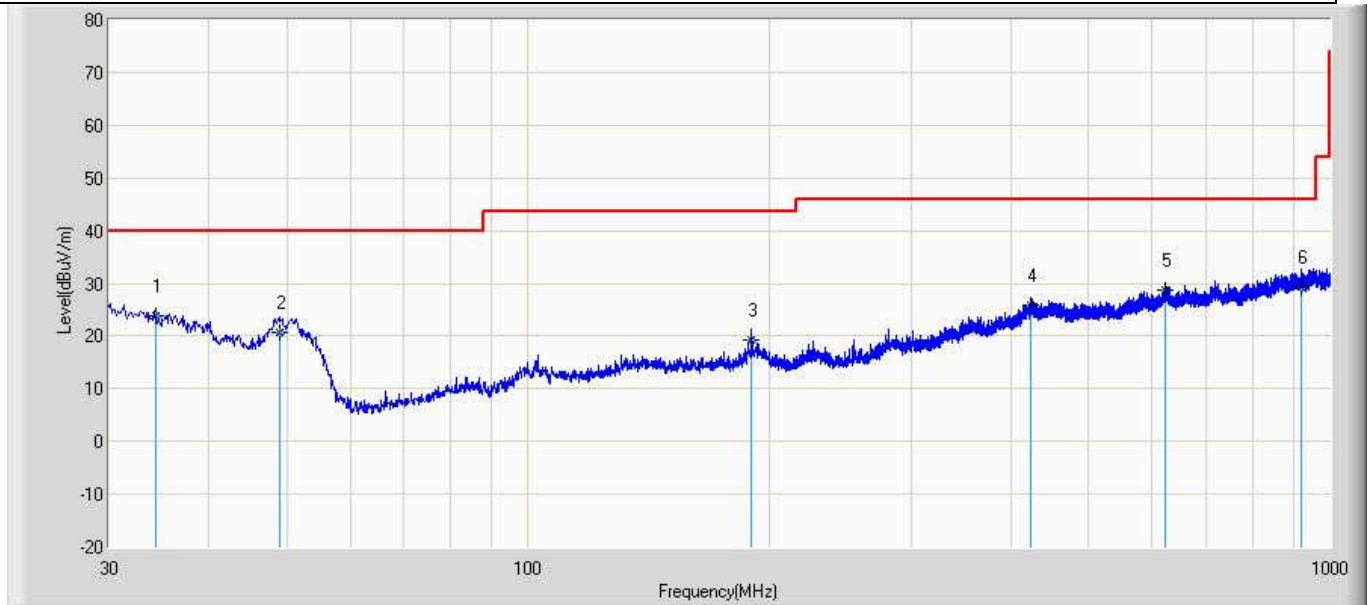


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		19840.000	37.966	34.112	-36.034	74.000	3.853	PK
2		22320.000	38.398	33.469	-35.602	74.000	4.929	PK
3	*	24800.000	40.201	34.599	-33.799	74.000	5.602	PK

Remark	<ol style="list-style-type: none"> 1. " * ", means this data is the worst emission level. 2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp). 3. The test frequency range, 9kHz~30MHz of the worst case are at least 6dB below the limits, therefore no data appear in the report. 4. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed. 5. The complete raw data please refer to Appendix RSE, Shown in the report is the worst data.
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The worst case of Radiated Emission below 1GHz:

Profile: 2040637R	Page No.: 1
Engineer: fox	
Site: AC3	Time: 2020/04/24
Limit: FCC_Part15.209_RE(3m)_ClassB	Margin: 0
Probe: AC3_3m (30-1000MHz)	Polarity: Horizontal
EUT: Tunable White Direct Connect Smart Bulb	Power: AC 120V/60Hz
Note: Mode 1	

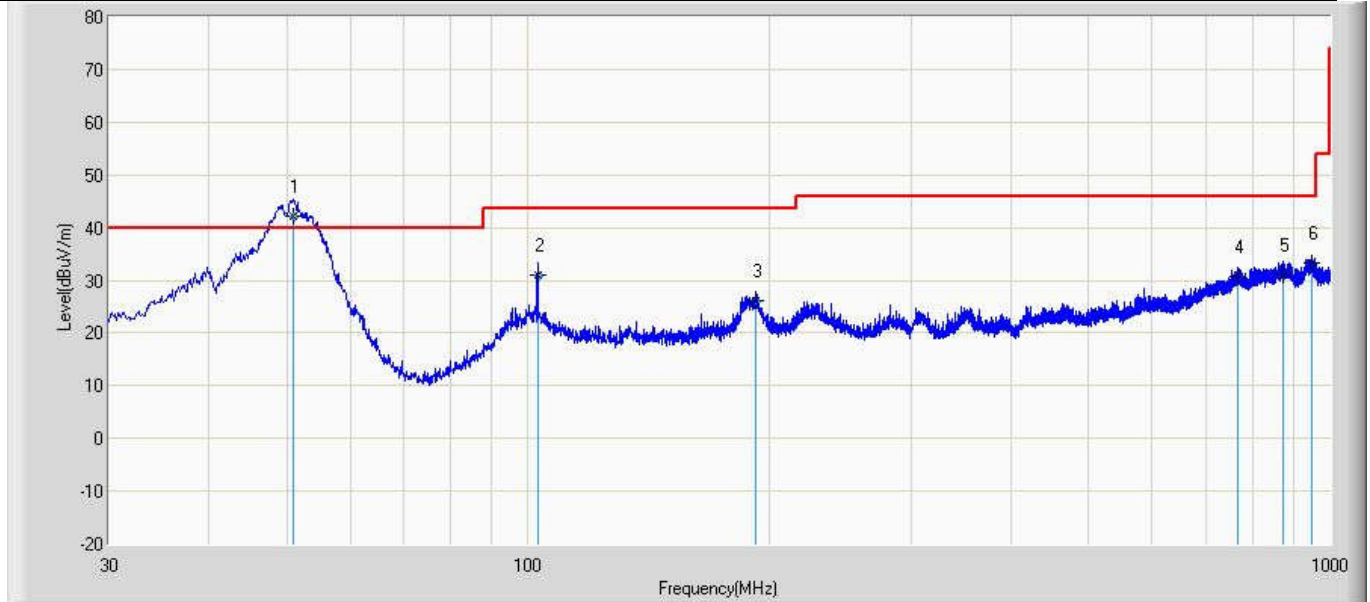


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	*	34.340	23.757	-2.000	-16.243	40.000	19.271	6.486	0.000	100	20	QP
2		48.900	20.792	5.000	-19.208	40.000	9.212	6.580	0.000	100	230	QP
3		190.000	19.246	2.100	-24.254	43.500	9.900	7.247	0.000	100	80	QP
4		424.000	25.780	-1.600	-20.220	46.000	19.412	7.968	0.000	100	230	QP
5		624.200	28.669	-1.200	-17.331	46.000	21.380	8.489	0.000	100	55	QP
6		920.460	29.219	-3.000	-16.781	46.000	23.081	9.138	0.000	100	180	QP

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Profile: 2040637R	Page No.: 2
Engineer: fox	
Site: AC3	Time: 2020/04/24
Limit: FCC_Part15.209_RE(3m)_ClassB	Margin: 0
Probe: AC3_3m (30-1000MHz)	Polarity: Vertical
EUT: Tunable White Direct Connect Smart Bulb	Power: AC 120V/60Hz
Note: Mode 1	



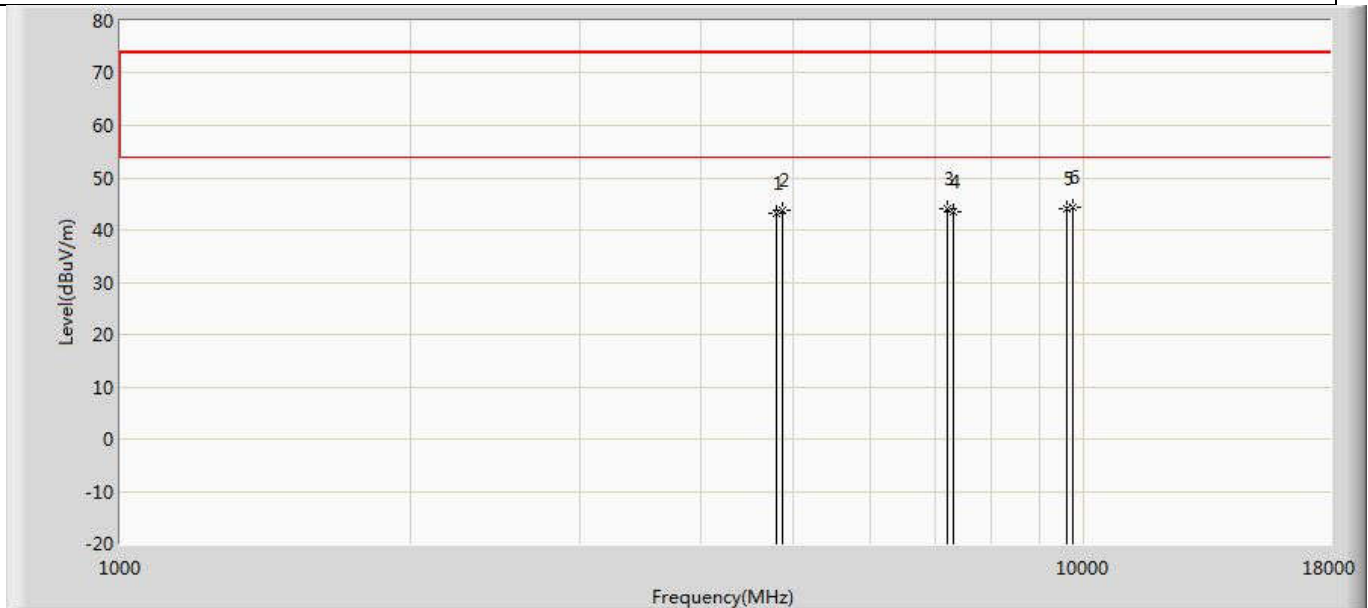
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	*	50.958	42.296	24.300	2.296	40.000	11.404	6.593	0.000	100	180	QP
2		102.750	30.876	8.800	-12.624	43.500	15.209	6.867	0.000	100	120	QP
3		192.000	26.248	4.900	-17.252	43.500	14.101	7.247	0.000	100	230	QP
4		768.400	30.802	-1.500	-15.198	46.000	23.486	8.816	0.000	100	50	QP
5		873.900	30.902	-2.000	-15.098	46.000	23.854	9.048	0.000	100	55	QP
6		948.833	33.254	-1.600	-12.746	46.000	25.656	9.198	0.000	100	230	QP

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

The worst case of Simultaneous transmission:

Profile: 2040637R	Page No.: 129
Engineer: YULIU	
Site: AC5	Time: 2020/05/20 - 15:05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: Tunable White Direct Connect Smart Bulb	Power: AC 120V/60Hz
Note: Mode 1:Transmit at BLE 2402MHz and 802.11n20 2437MHz	

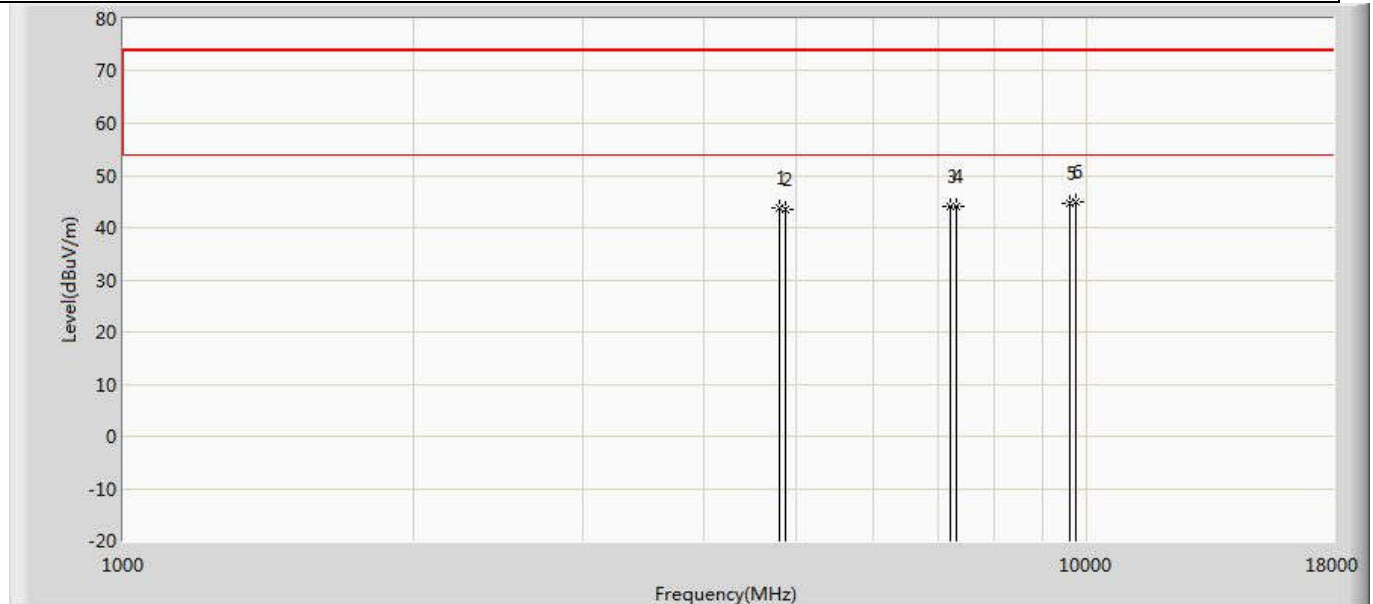


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4804.000	43.248	39.587	-30.752	74.000	3.662	PK
2		4874.000	43.642	39.955	-30.358	74.000	3.687	PK
3		7206.000	44.057	37.394	-29.943	74.000	6.663	PK
4		7311.000	43.542	36.912	-30.458	74.000	6.630	PK
5		9608.000	44.128	35.992	-29.872	74.000	8.137	PK
6	*	9748.000	44.231	35.611	-29.769	74.000	8.620	PK

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Profile: 2040637R	Page No.: 130
Engineer: YULIU	
Site: AC5	Time: 2020/05/20 - 15:13
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: Tunable White Direct Connect Smart Bulb	Power: AC 120V/60Hz
Note: Mode 1:Transmit at BLE 2402MHz and 802.11n20 2437MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4804.000	43.685	40.024	-30.315	74.000	3.662	PK
2		4874.000	43.348	39.661	-30.652	74.000	3.687	PK
3		7206.000	43.998	37.335	-30.002	74.000	6.663	PK
4		7311.000	44.015	37.385	-29.985	74.000	6.630	PK
5		9608.000	44.681	36.545	-29.319	74.000	8.137	PK
6	*	9748.000	44.824	36.204	-29.176	74.000	8.620	PK

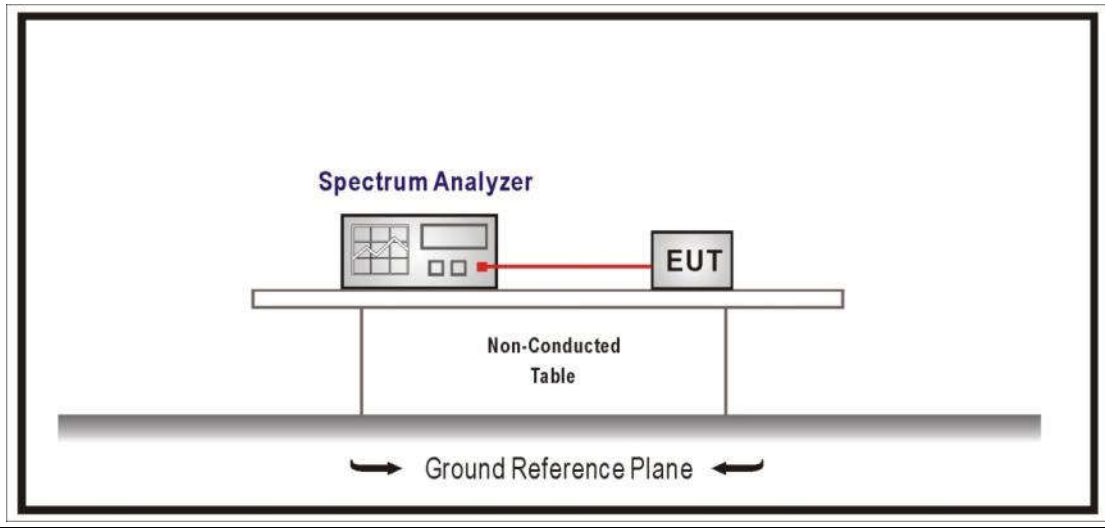
Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

4.3 Emissions in non-restricted frequency band	VERDICT: PASS
---	----------------------

4.3.1 Limit	
Standard	FCC Part 15 Subpart C Paragraph 15.247(d)
RF Output power (Detection methods)	Limit(dB)
RF Output power(Average detector)	30dBc(Note1)
RF Output power(PK detector)	20dBc(Note2)
<p>Note 1: If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).</p> <p>Note 2: If the maximum peak conducted output power procedure was used, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).</p>	

4.3.2 Test Setup



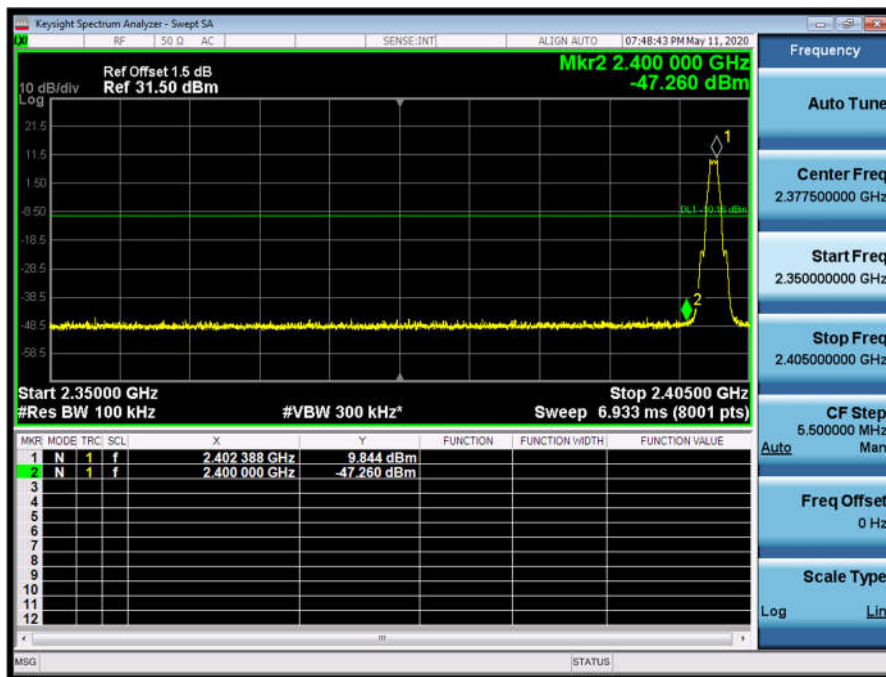
4.3.3 Test Procedure			
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References Rule	Chapter	Description	
<input checked="" type="checkbox"/> ANSI C63.10	11.11	Emissions in non-restricted frequency bands	
<input checked="" type="checkbox"/>	ANSI C63.10	11.11.1	General
<input checked="" type="checkbox"/>	ANSI C63.10	11.11.2	Reference level measurement
<input checked="" type="checkbox"/>	ANSI C63.10	11.11.3	Emission level measurement

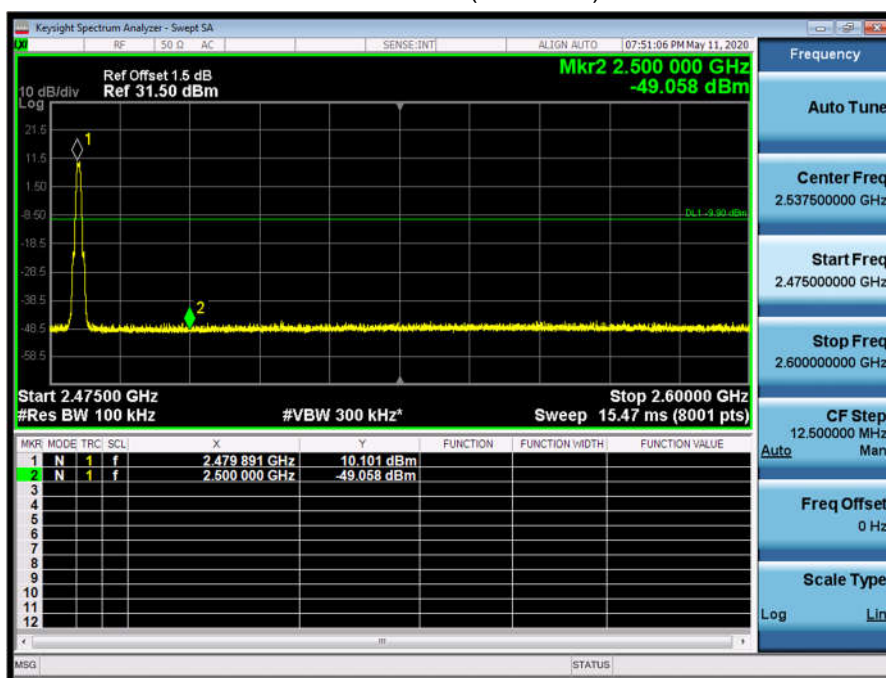
4.3.4 Test Data

Mode	Channel	Test Frequency (MHz)	Maximum In-Band PSD[a] (dBm/100kHz)	Frequency (MHz)	Out-Band PSD[b] (dBm/100kHz)	[a]-[b] (dB)	Limit (dB)	Result
1	00	2402	9.844	2400	-47.260	57.104	>20	Pass
	39	2480	10.101	2500	-49.058	59.159	>20	Pass

Mode 1 CH00(2402MHz)



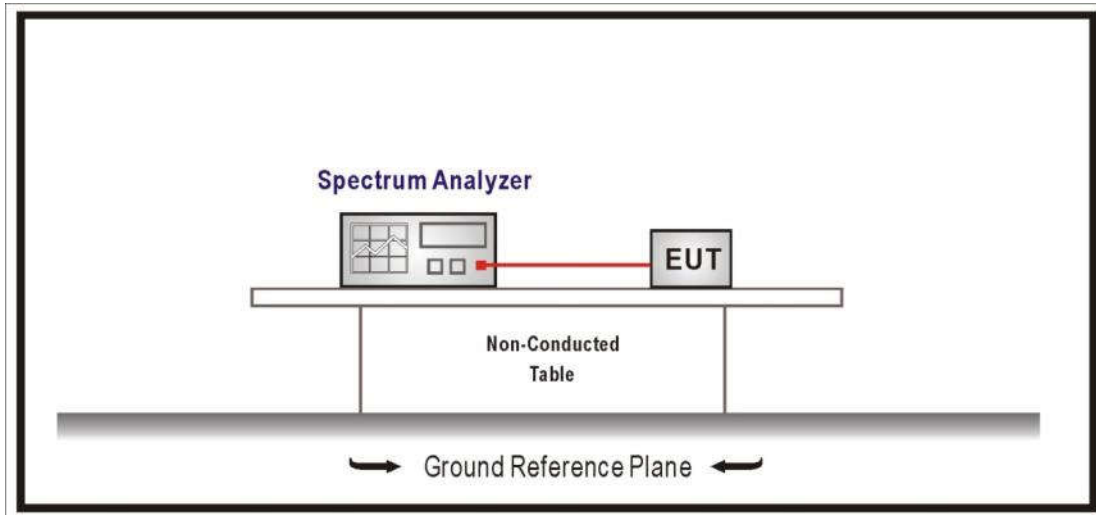
Mode 1 CH39(2480MHz)



4.4 Duty cycle	VERDICT: PASS
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4.4.1 Limit
N/A

4.4.2 Test Setup



4.4.3 Test Procedure

	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10	11.6	Duty cycle (D), transmission duration (T), and maximum power control level

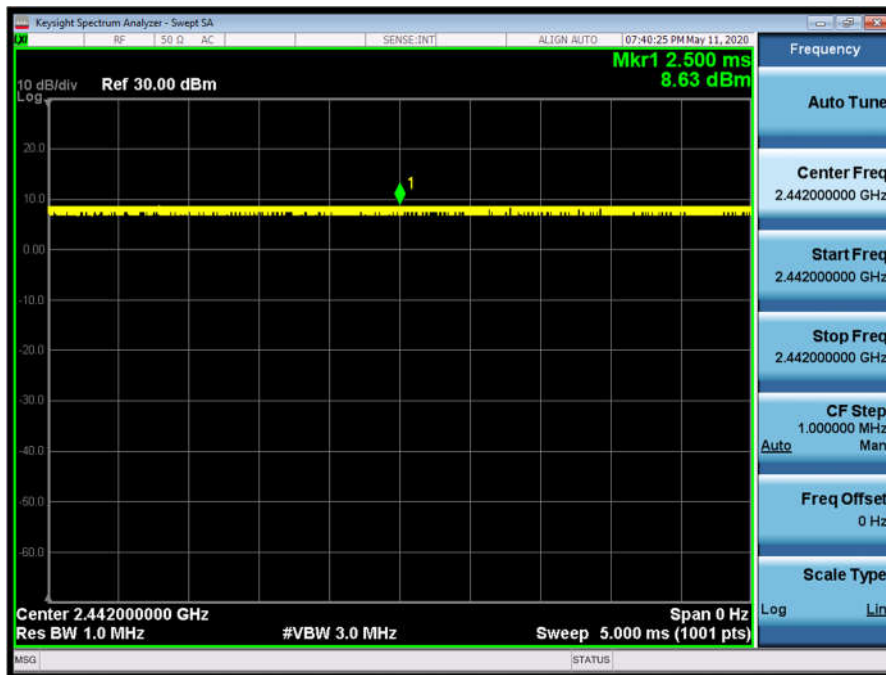
4.4.4 Test Data

Test Mode	Tx On (ms)	Tx Off (ms)	VBW	Tx On + Tx Off (ms)	Duty Cycle
Mode 1	N/A	N/A	10	N/A	100%

Note 1: T means the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Note 2: According to KDB 558074, when test for Radiated Emission Band Edge and Radiated Emission, for average detector set: $VBW \geq 1/T$ will be used.

Mode 1



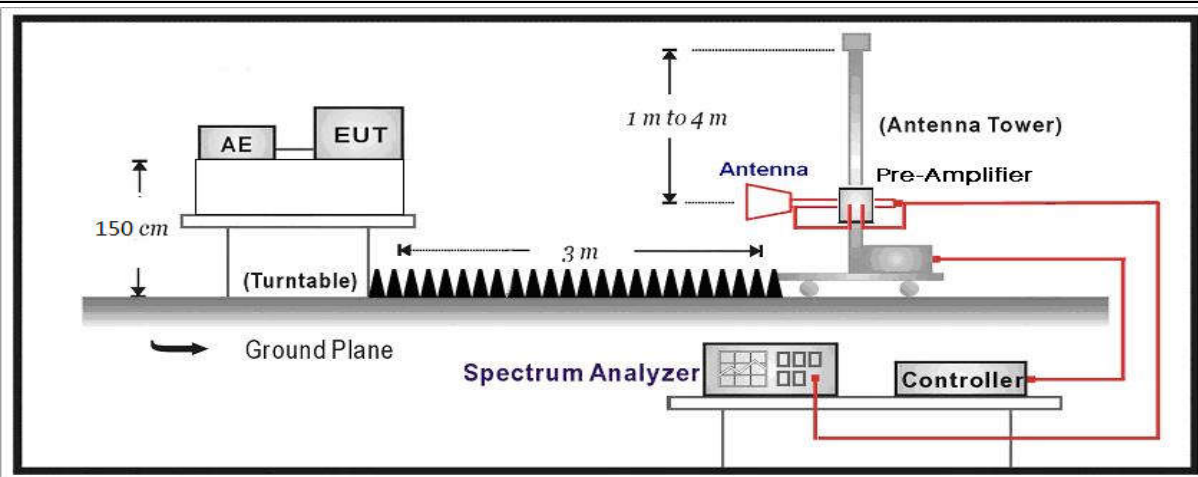
4.5 Radiated Emission Band Edge **VERDICT: PASS**

4.5.1 Limit				
Standard		FCC Part 15 Subpart C Paragraph 15.247(d) , 15.209		
Frequency bands (MHz)	Detector	Limit (dBµV/m)	RBW (MHz)	Distance (m)
2310-2390	PK	74	1	3
2483.5-2500	AV	54	1	3

Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits.

4.5.2 Test Setup

Above 1GHz Test Setup:

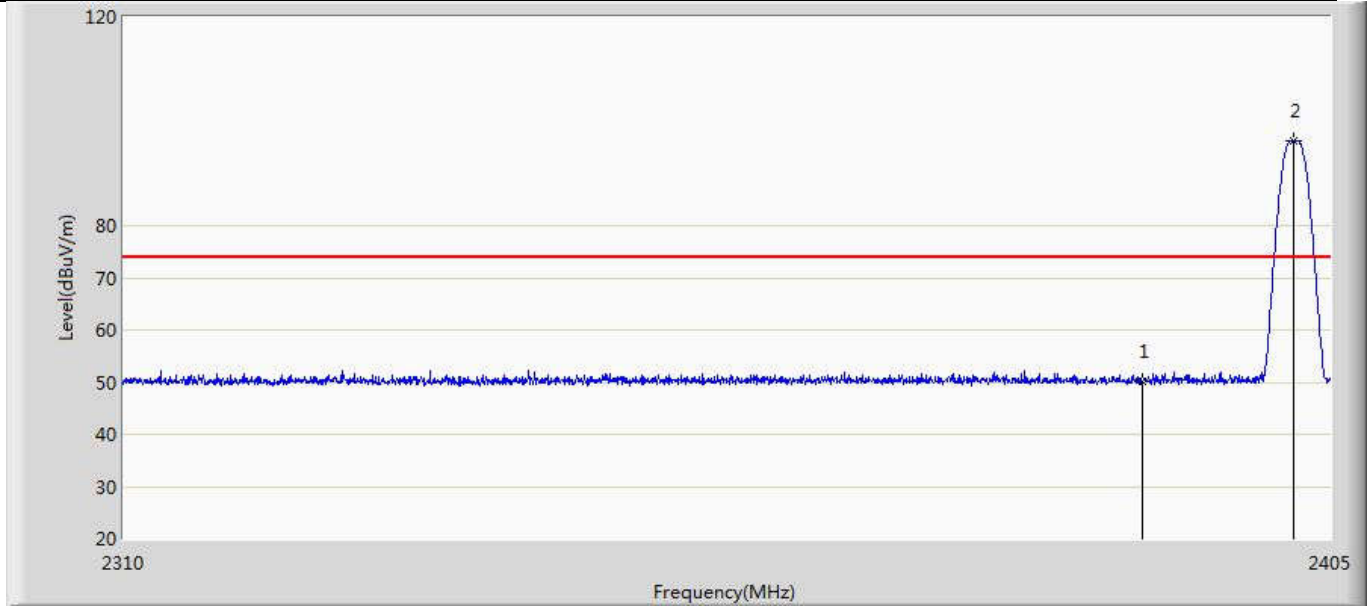


4.5.3 Test Procedure

	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10	6.10	Band-edge testing
	<input checked="" type="checkbox"/> ANSI C63.10	6.10.5	Restricted-band band-edge measurements
	<input type="checkbox"/> ANSI C63.10	6.10.6	Marker-delta method
<input checked="" type="checkbox"/>	ANSI C63.10	11.12	Emissions in restricted frequency bands
	<input checked="" type="checkbox"/> ANSI C63.10	11.12.1	Radiated emission measurements
	<input checked="" type="checkbox"/> ANSI C63.10	11.12.2.7	Radiated spurious emission test
<input type="checkbox"/>	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
<input type="checkbox"/>	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
<input checked="" type="checkbox"/>	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

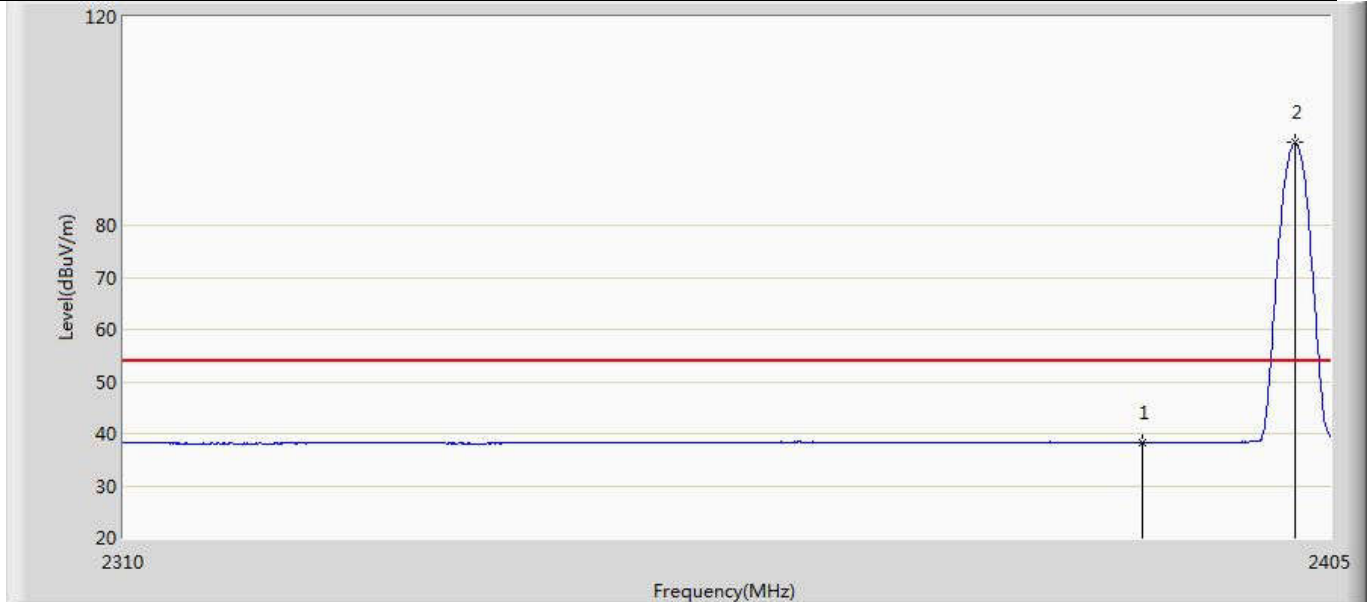
4.5.4 Test Data

Profile: 2040637R	Page No.: 1
Engineer: YULIU	
Site: AC5	Time: 2020/03/12 - 00:39
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1: Transmit at 2402MHz by BLE	



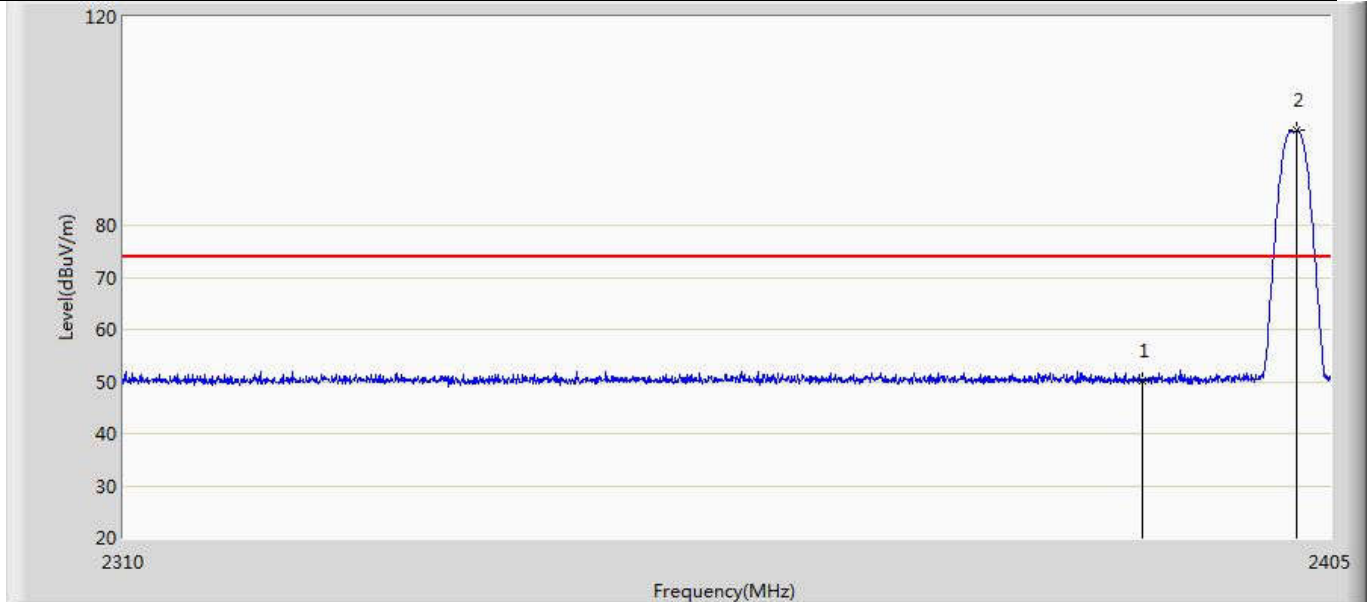
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	50.082	14.767	-23.918	74.000	35.315	PK
2	*	2402.055	96.276	60.964	22.276	74.000	35.312	PK

Profile: 2040637R	Page No.: 2
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:23
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



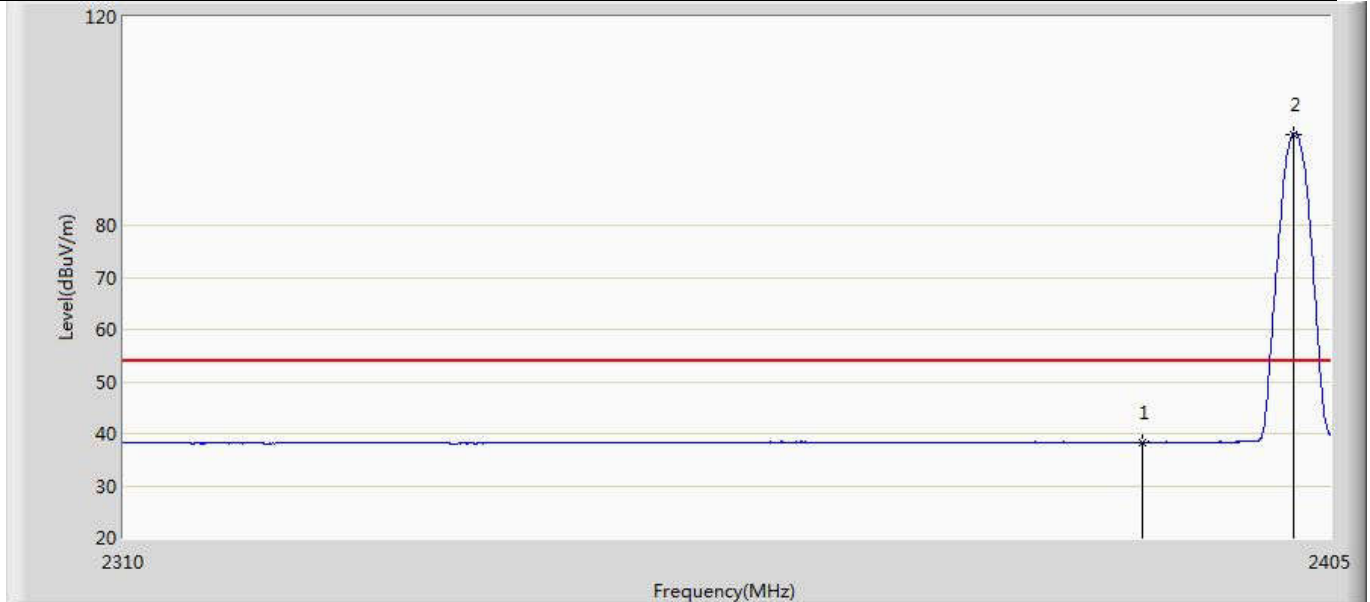
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	38.306	2.991	-15.694	54.000	35.315	AV
2	*	2402.198	95.843	60.531	41.843	54.000	35.312	AV

Profile: 2040637R	Page No.: 3
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



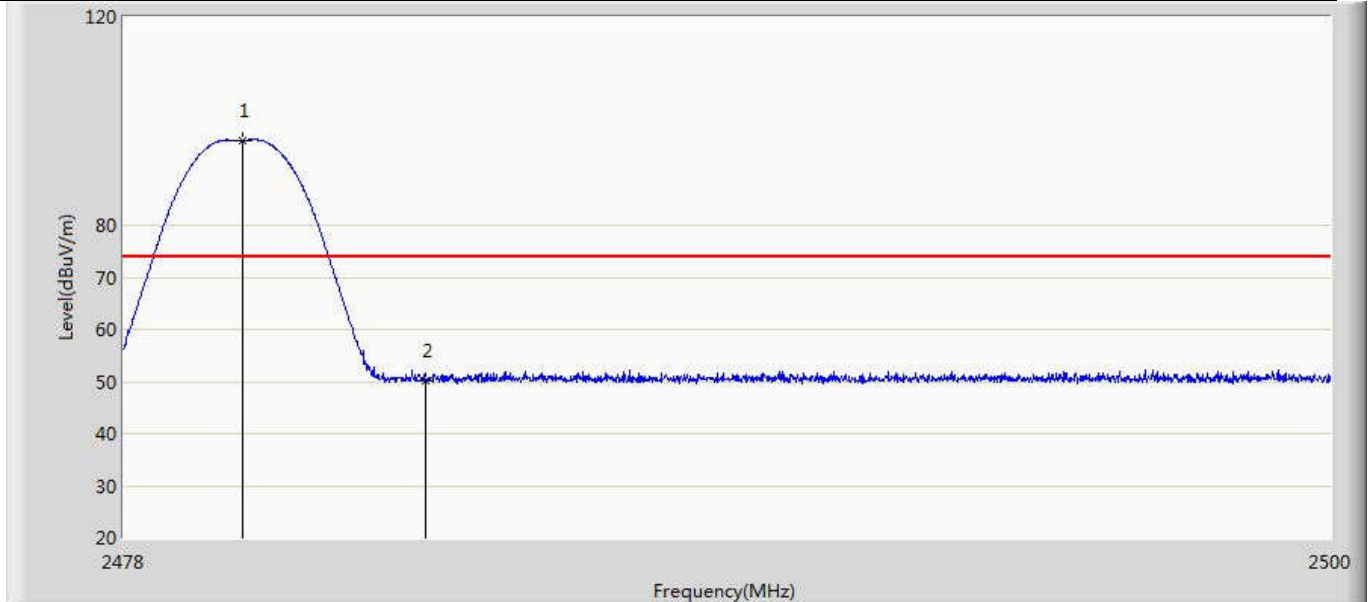
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	50.172	14.857	-23.828	74.000	35.315	PK
2	*	2402.292	98.128	62.816	24.128	74.000	35.312	PK

Profile: 2040637R	Page No.: 4
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:28
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2402MHz by BLE	



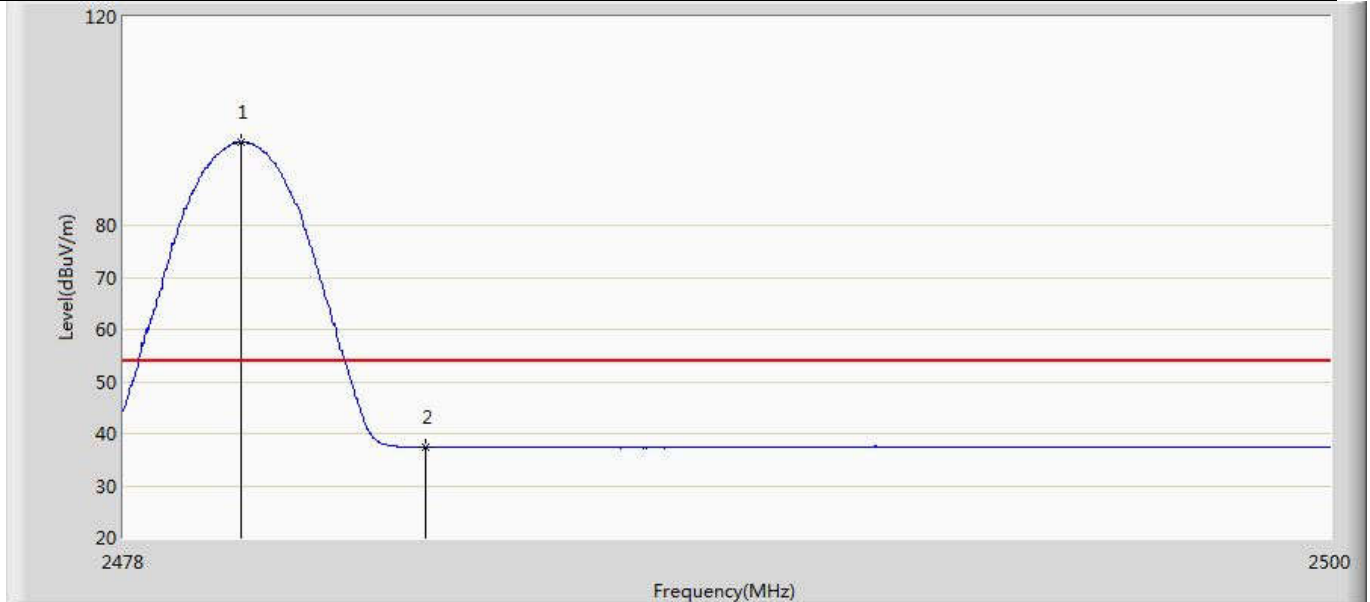
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	38.297	2.982	-15.703	54.000	35.315	AV
2	*	2402.055	97.531	62.219	43.531	54.000	35.312	AV

Profile: 2040637R	Page No.: 5
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:29
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



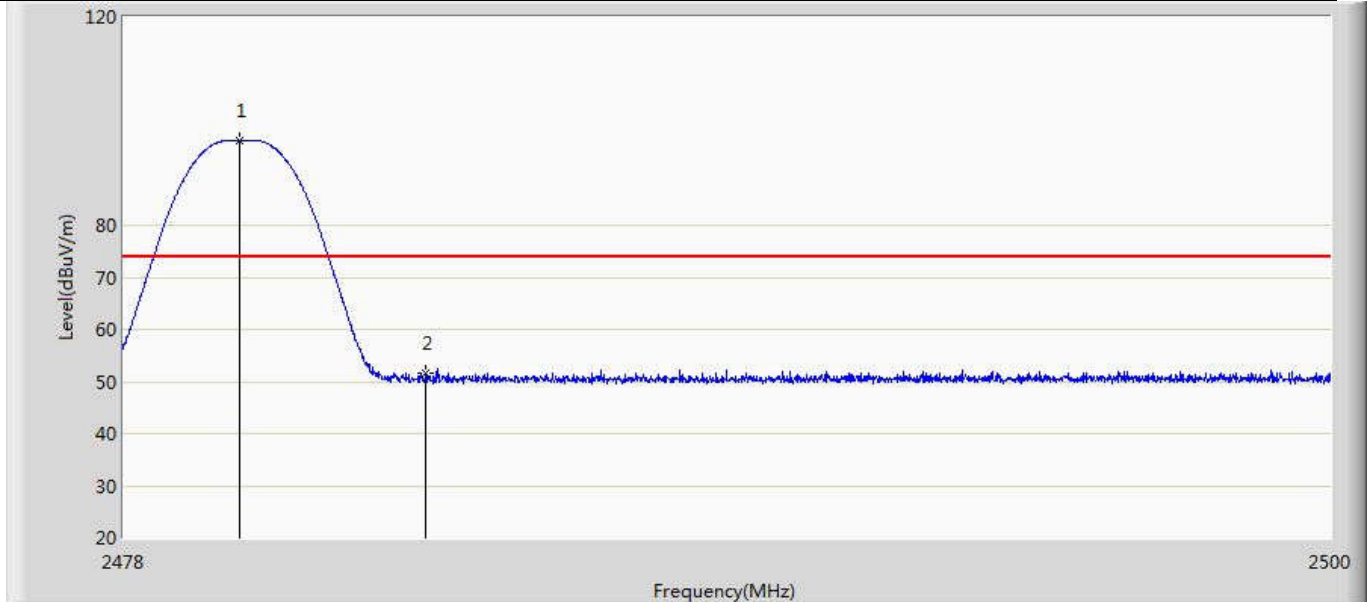
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.178	96.303	61.004	22.303	74.000	35.299	PK
2		2483.500	50.222	14.924	-23.778	74.000	35.297	PK

Profile: 2040637R	Page No.: 6
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:32
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



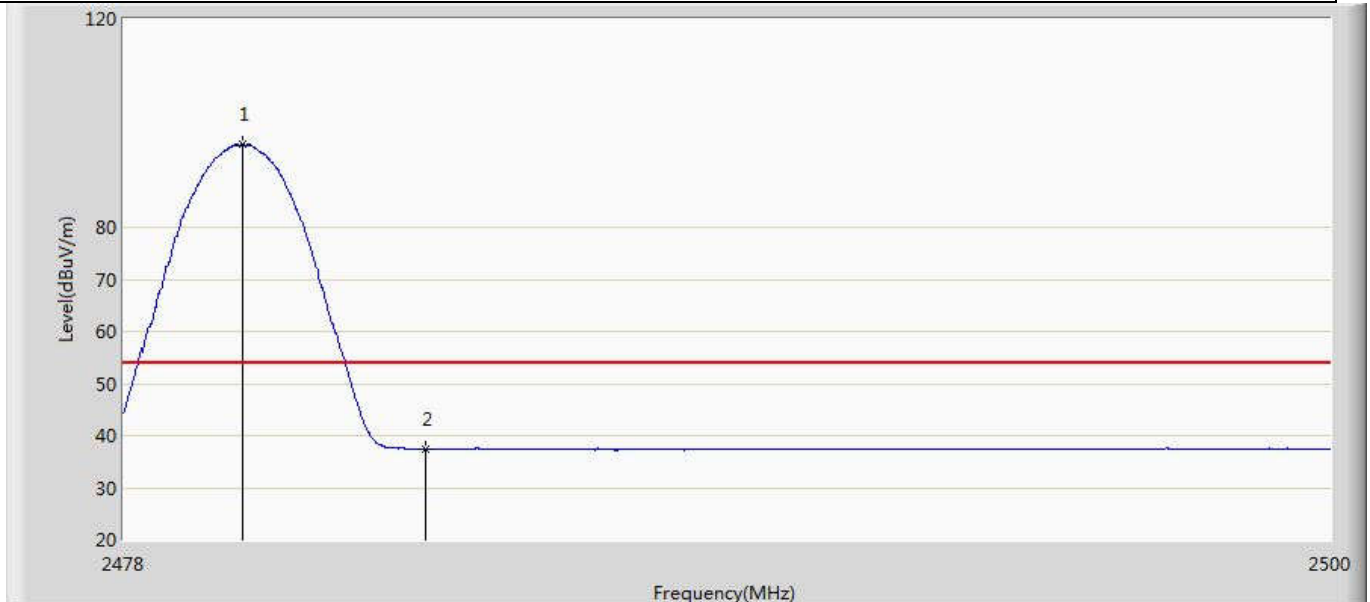
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.145	95.898	60.599	41.898	54.000	35.299	AV
2		2483.500	37.450	2.152	-16.550	54.000	35.297	AV

Profile: 2040637R	Page No.: 7
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:34
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.112	96.119	60.820	22.119	74.000	35.299	PK
2		2483.500	51.516	16.218	-22.484	74.000	35.297	PK

Profile: 2040637R	Page No.: 8
Engineer: YULIU	
Site: AC5	Time: 2020/04/29 - 01:36
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: TUNABLE WHITE DIRECT CONNECT SMART BULB	Power: AC 120V/60Hz
Note: Mode 1:Transmit at 2480MHz by BLE	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.178	95.841	60.542	41.841	54.000	35.299	AV
2		2483.500	37.499	2.201	-16.501	54.000	35.297	AV

Note:

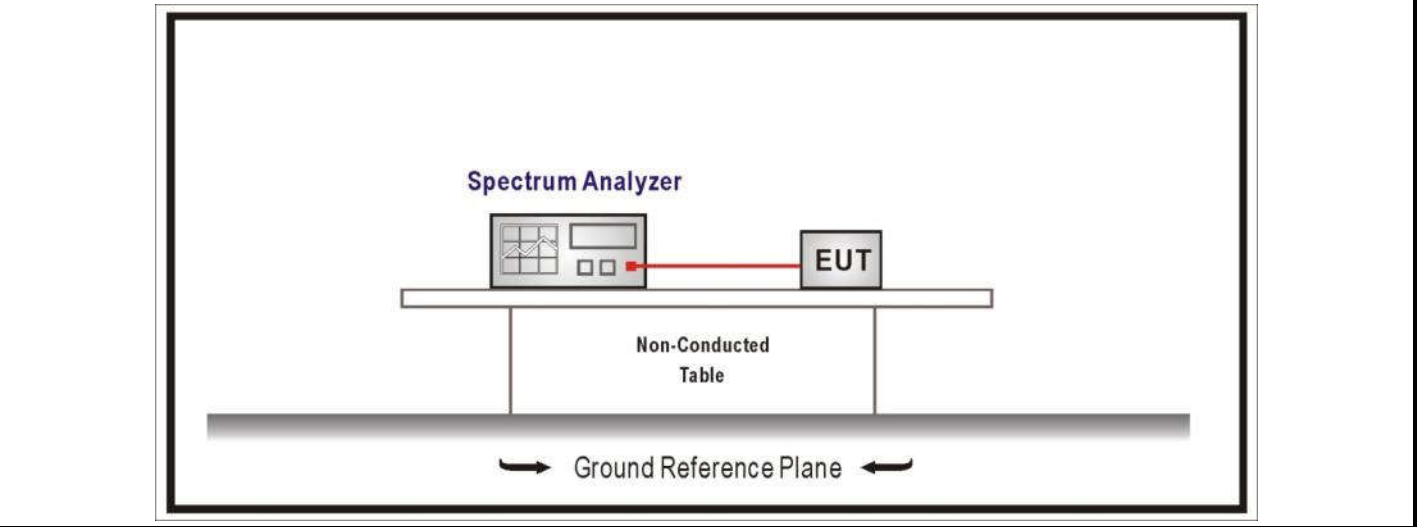
1. Measured Level = Reading Level + Factor.
2. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.
3. As the radiated emission was performed, so conducted emission was not tested.

4.6 DTS Bandwidth	VERDICT: PASS
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4.6.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.247 (a)(2)
Systems using digital modulation techniques operate in the 2400-2483.5 MHz. The minimum 6 dB bandwidth shall be at least 500 kHz	

4.6.2 Test Setup



4.6.3 Test Procedure

	Reference Rule	Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10	11.8	DTS bandwidth
<input type="checkbox"/>	ANSI C63.10	11.8.1	Option 1
<input checked="" type="checkbox"/>	ANSI C63.10	11.8.2	Option 2

4.6.4 Test Data

Mode	CH.	Test Freq. (MHz)	99% Occupied Bandwidth (MHz)	6dB Occupied Bandwidth (MHz)	Limit (kHz)	Result
1	00	2402	1.4468	0.7286	>500	Pass
	20	2442	1.4418	0.7251	>500	Pass
	39	2480	1.4094	0.7229	>500	Pass

Note : The worst case of Occupied Bandwidth as below in next page:

**99% Occupied Bandwidth
Mode 1 CH39 (2480MHz)**

Occupied Bandwidth 1.0462 MHz

Transmit Freq Error	144.69 kHz	% of OBW Power	99.00 %
x dB Bandwidth	605.0 kHz	x dB	-6.00 dB

**6dB Occupied Bandwidth
Mode 1 CH39 (2480MHz)**

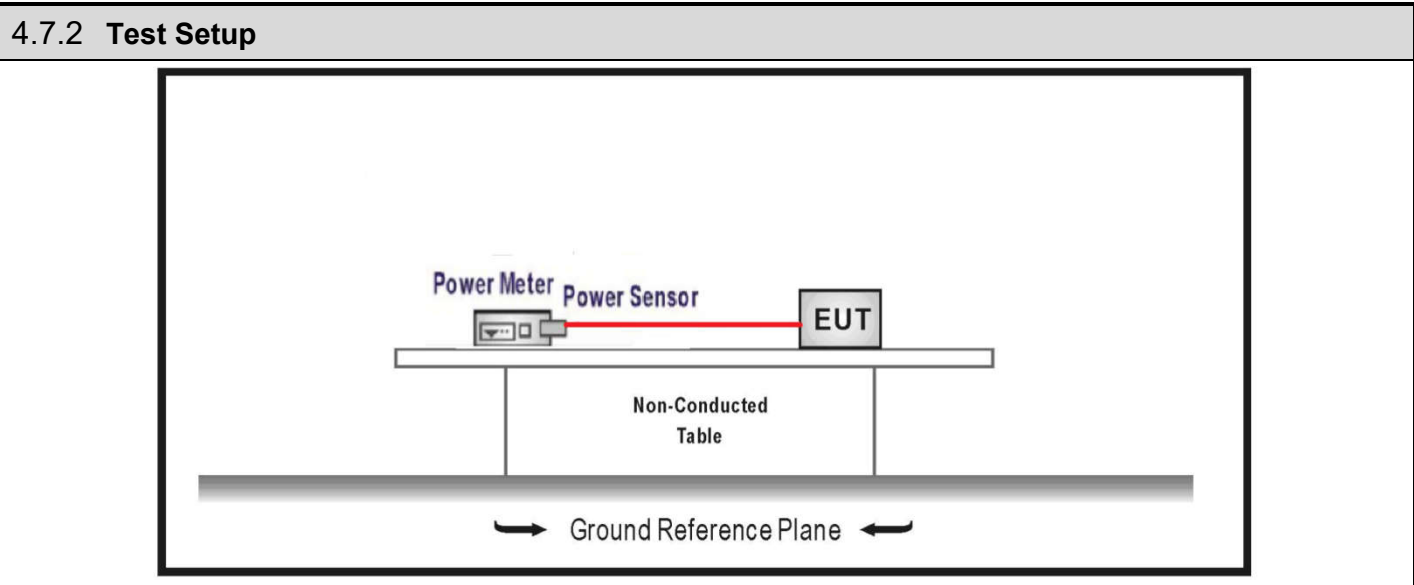
Occupied Bandwidth 1.0402 MHz

Transmit Freq Error	142.34 kHz	% of OBW Power	99.00 %
x dB Bandwidth	694.2 kHz	x dB	-6.00 dB

4.7 Fundamental emission output power	VERDICT: PASS
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4.7.1 Limit			
Standard	FCC Part 15 Subpart C Paragraph 15.247 (b)(3)		
<input checked="" type="checkbox"/>	GTX < 6dBi	Pout ≤ 30dBm	
<input type="checkbox"/>	GTX > 6dBi		
<input type="checkbox"/>	Non-Fix point-point	Pout ≤ 30 - (GTX - 6)	
<input type="checkbox"/>	Fix point-point	Pout ≤ 30 - [(GTX - 6)]/3	
<input type="checkbox"/>	Point-to-multipoint	Pout ≤ 30 - (GTX - 6)	
<input type="checkbox"/>	Overlap Beams	Pout ≤ 30 - [(GTX - 6)]/3	
<input type="checkbox"/>	Aggregate power transmitted simultaneously on all beams	Pout ≤ 30 - [(GTX - 6)]/3	
<input type="checkbox"/>	single directional beam	Pout ≤ 30 - [(GTX - 6)]/3 + 8dB	

Note 1 : GTX directional gain of transmitting antennas.
 Note 2 : Pout is maximum peak conducted output power .



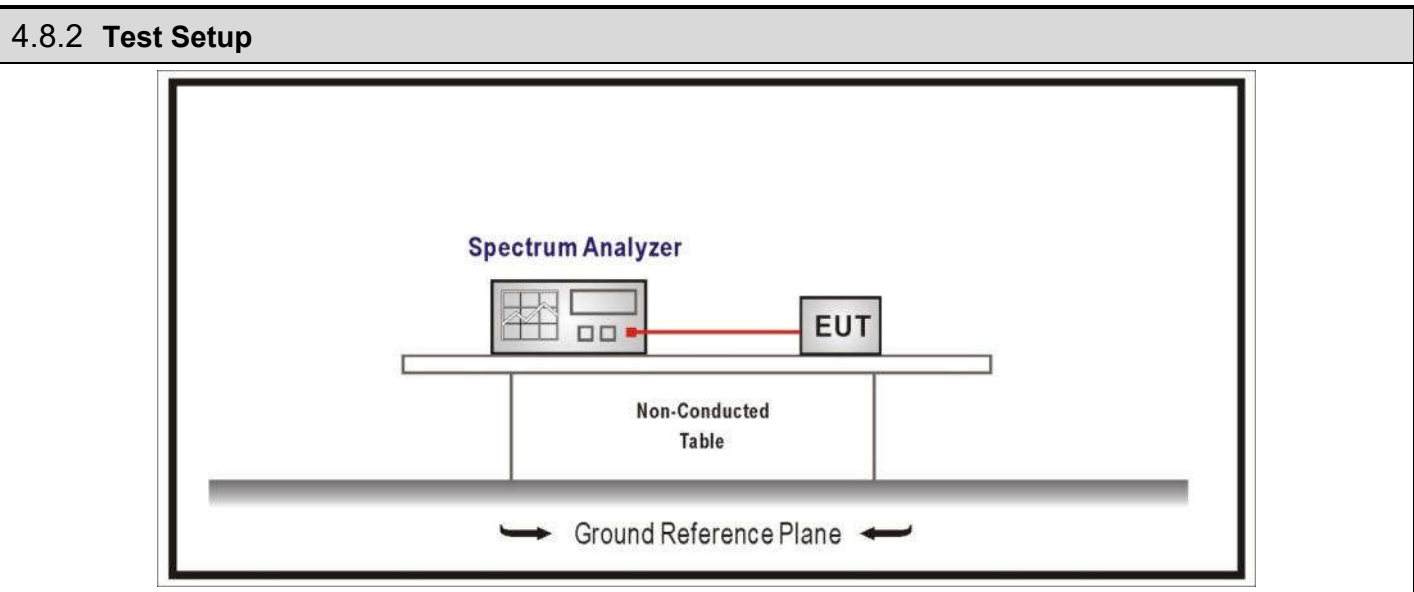
4.7.3 Test Procedure				
	References Rule		Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10		11.9	Fundamental emission output power
	<input checked="" type="checkbox"/>	ANSI C63.10	11.9.1	Maximum peak conducted output power
	<input type="checkbox"/>	ANSI C63.10	11.9.1.1	RBW \geq DTS bandwidth
	<input type="checkbox"/>	ANSI C63.10	11.9.1.2	Integrated band power method
	<input type="checkbox"/>	ANSI C63.10	11.9.1.3	PKPM1 Peak power meter method
	<input type="checkbox"/>	ANSI C63.10	11.9.2	Maximum conducted (average) output power
	<input type="checkbox"/>	ANSI C63.10	11.9.2.2	Measurement using a spectrum analyzer (SA)
	<input type="checkbox"/>	ANSI C63.10	11.9.2.2.2	Method AVGSA-1(Duty cycle \geq 98%)
	<input type="checkbox"/>	ANSI C63.10	11.9.2.2.3	Method AVGSA-1A(Duty cycle \geq 98%)
	<input type="checkbox"/>	ANSI C63.10	11.9.2.2.4	Method AVGSA-2(Duty cycle \leq 98%)
	<input type="checkbox"/>	ANSI C63.10	11.9.2.2.5	Method AVGSA-2A(Duty cycle \leq 98%)
	<input type="checkbox"/>	ANSI C63.10	11.9.2.2.4	Method AVGSA-3
	<input type="checkbox"/>	ANSI C63.10	11.9.2.2.5	Method AVGSA-3A
	<input checked="" type="checkbox"/>	ANSI C63.10	11.9.2.3	Measurement using a power meter (PM)
	<input checked="" type="checkbox"/>	ANSI C63.10	11.9.2.3.1	Method AVGPM
	<input type="checkbox"/>	ANSI C63.10	11.9.2.3.2	Method AVGPM-G

4.7.4 Test Data

Mode	Channel	Test Frequency (MHz)	Power Output (dBm)	Limit (dBm)	Result
Mode 1	00	2402	9.98	≤ 30	Pass
	20	2442	10.83	≤ 30	Pass
	39	2480	10.45	≤ 30	Pass

4.8 Power Density	VERDICT: PASS
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4.8.1 Limit:	
Standard	FCC Part 15 Subpart C Paragraph 15.247 (b)(3)
Power Spectral Density $\leq 8\text{dBm}/3\text{kHz}$	



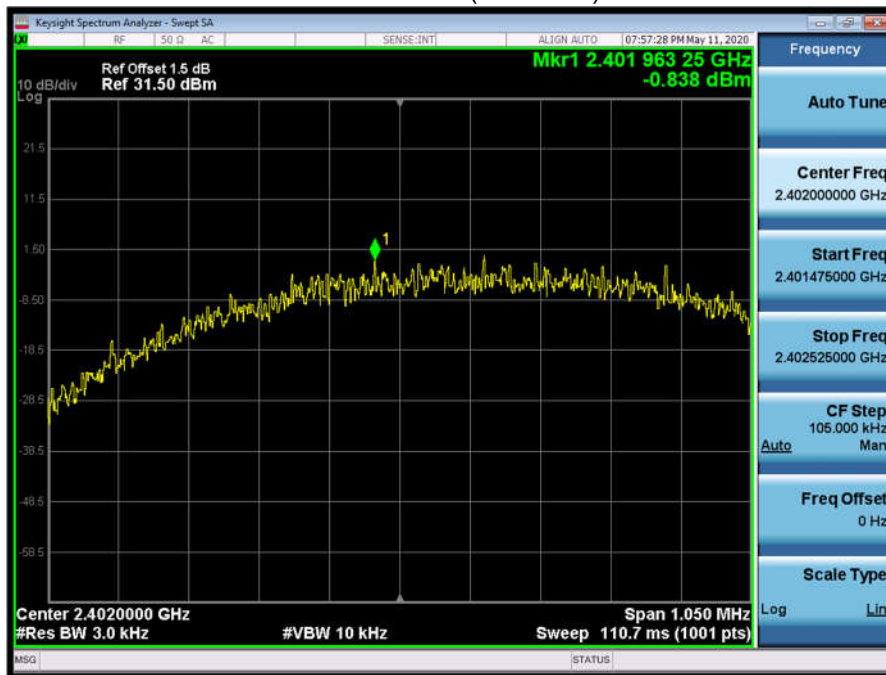
4.8.3 Test Procedure

	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ANSI C63.10	11.10	Maximum power spectral density level in the fundamental emission
<input checked="" type="checkbox"/>	ANSI C63.10	11.10.2	Method PKPSD (peak PSD)
<input type="checkbox"/>	ANSI C63.10	11.10.3	Method AVGPSD-1(Duty cycle $\geq 98\%$)
<input type="checkbox"/>	ANSI C63.10	11.10.4	Method AVGPSD-1A(Duty cycle $\geq 98\%$)
<input type="checkbox"/>	ANSI C63.10	11.10.5	Method AVGPSD-2(Duty cycle $< 98\%$)
<input type="checkbox"/>	ANSI C63.10	11.10.6	Method AVGPSD-2A(Duty cycle $< 98\%$)
<input type="checkbox"/>	ANSI C63.10	11.10.7	Method AVGPSD-3
<input type="checkbox"/>	ANSI C63.10	11.10.8	Method AVGPSD-3A

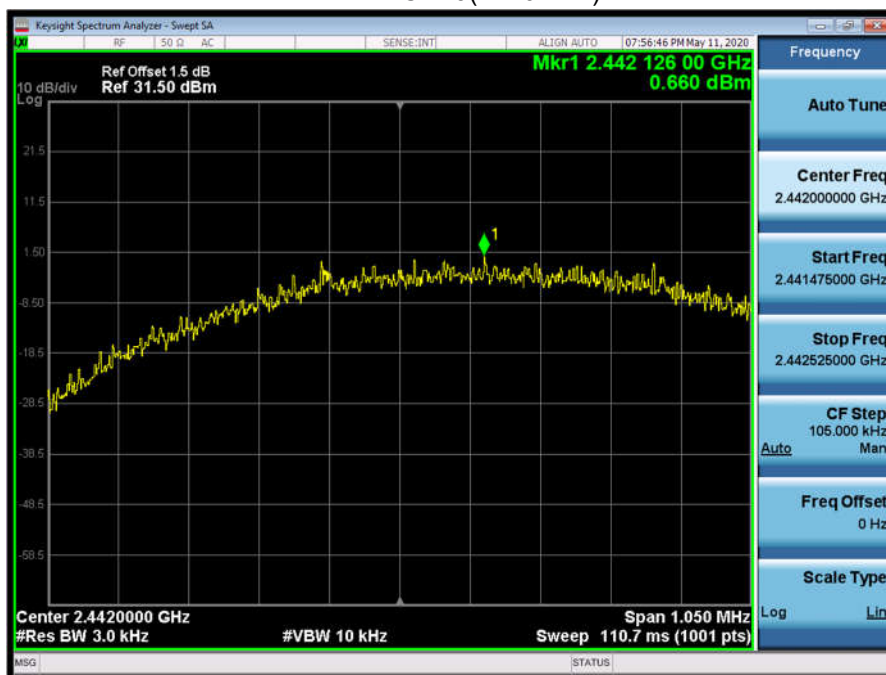
4.8.4 Test Data

Mode	Channel	Test Frequency (MHz)	Measurement PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Mode 1	00	2402	-0.838	≤8	Pass
	20	2442	0.660	≤8	Pass
	39	2480	1.015	≤8	Pass

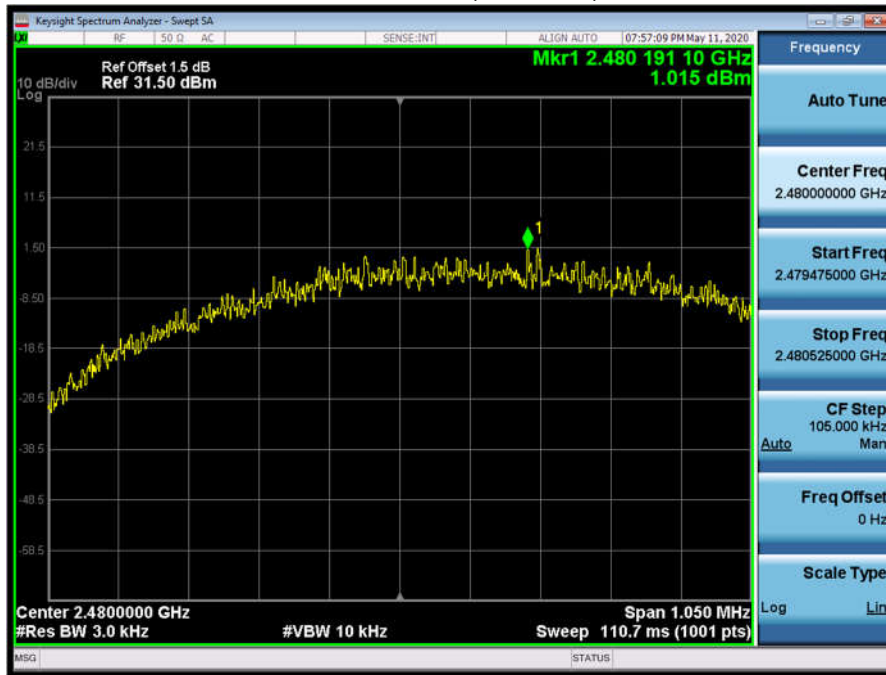
Mode 1 CH00(2402MHz)



Mode 1 CH19(2440MHz)



Mode 1 CH39(2480MHz)



4.9 Antenna Requirement	VERDICT: PASS
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4.9.1 Limit:	
Standard	FCC Part 15 Subpart C Paragraph 15.203
<p>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. 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.</p>	

4.9.2 Antenna Connector Construction:	
<input checked="" type="checkbox"/>	The use of a permanently attached antenna
<input type="checkbox"/>	The antenna use of a unique coupling to the intentional radiator
<input type="checkbox"/>	The use of a nonstandard antenna jack or electrical connector
Please refer to the attached document "Internal Photograph" to show the antenna connector.	

4.10 Test setup photo and EUT Photo
--

VERDICT: PASS

Remark: The test setup photo and EUT Photo please see appendix.

_____ The End _____