FCC Part 15C Test Report

FCC ID: 2AE53OMW168A

Product Name:	**Smart Bulb**
Trademark:	
Model Name :	**OMW168A** **OMW168B, OMW169A, OMW170A, OMW170B.**
Prepared For : Address :	**Lighkeep Limited** RM.517, NEW CITY CENTRE, 2 LEI YUE MUN ROAD, KWUN TONG, KOWLOON. HK
Prepared By : Address :	**Shenzhen BCTC Technology Co., Ltd.** No.101,Yousong Road,Longhua New District, Shenzhen,China
Test Date:	**Jun. 15 - Jun. 24, 2015**
Date of Report :	**Jun. 24, 2015**
Report No.:	**BCTC-15060101**

VERIFICATION OF COMPLIANCE

Applicant's name..... : Lighkeep Limited

Address..... : RM.517, NEW CITY CENTRE, 2 LEI YUE MUN ROAD, KWUN TONG, KOWLOON. HK

Manufacture's Name..... : Lighkeep Technology Co., Ltd.

Address..... : Room 705, No. 528 Shenhui Road , Henggang Longgang District, Shenzhen City

Product description

Product name.....: Smart Bulb

Trademark:

Model Name: OMW168A

Test procedure FCC Part15.247

Standards ANSI C63.10-2013

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Result..... : **Pass**

Testing Engineer : Eric Yang

(Eric Yang)

Technical Manager : Sophie Lee

(Sophia Lee)

Authorized Signatory : Carson. Zhang

(Carson. Zhang)

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(a)(1)	Hopping Channel Separation	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(c)	Radiated Spurious Emission	PASS	
15.247(a)(iii)	Number of Hopping Frequency	PASS	
15.247(a)(iii)	Dwell Time	PASS	
15.247(a)(1)	Bandwidth	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 TEST FACILITY

Shenzhen BCTC Technology Co., Ltd.
Add.:No.101,Yousong Road,Longhua New District, Shenzhen,China
FCC Registration No.:187086

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Smart Bulb
Trade Name	N/A
Model Name	OMW168A
Serial Model	OMW168B, OMW169A, OMW170A, OMW170B.
Model Difference	All the same,Only shell color is different.
Product Description	The EUT is a Smart Bulb Operation Frequency: 2402~2480 MHz Modulation Type: BT(1Mbps): GFSK BT EDR(2Mbps): π/4-DQPSK BT EDR(3Mbps): 8-DPSK Bit Rate of Transmitter 1Mbps/2Mbps/3Mbps Number Of Channel 79 CH Antenna Designation: Please see Note 3. Output Power(Conducted): BT(1Mbps): 1.063dBm BT EDR(2Mbps): 1.05dBm BT EDR(3Mbps): 1.045Bm Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Channel List	Please refer to the Note 2.
Power	AC Power Input: 100-240V~, 50-60Hz, 0.2A
Battery	N/A
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459

04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	PCB Antenna	N/A	0	BT Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH00
Mode 2	CH39
Mode 3	CH78
Mode 4	Normal Link

For Conducted Emission	
Final Test Mode	Description
Mode 4	Normal Link

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH00
Mode 2	CH39
Mode 3	CH78

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) Fully-charged battery is used during the test

(3)The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

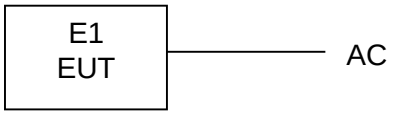
2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

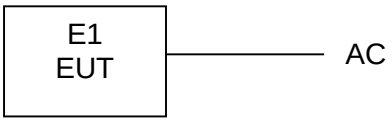
Test software Version	Test program: Broadcom		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters(1/2/3Mbps)	DEF	DEF	DEF

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission Test



Radiated Spurious Emission Test



2.5 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Smart Bulb	N/A	OMW168A	N/A	EUT
				N/A	

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2014.07.06	2015.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2015.06.07	2016.06.06	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2014.07.06	2015.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.06.07	2016.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2015.06.07	2016.06.06	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2014.07.06	2015.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2014.07.06	2015.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2014.12.22	2015.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2015.06.08	2016.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2014.07.06	2015.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2014.07.06	2015.07.05	1 year
12	RF cables	R&S	R203	R20X	2014.07.06	2015.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2015.06.06	2016.06.05	1 year
2	LISN	R&S	ENV216	101313	2014.08.24	2015.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2014.08.24	2015.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2015.06.07	2016.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2015.06.07	2016.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2015.06.08	2016.06.07	1 year
7	RF cables	R&S	R204	R20X	2014.07.06	2015.07.05	1 year

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

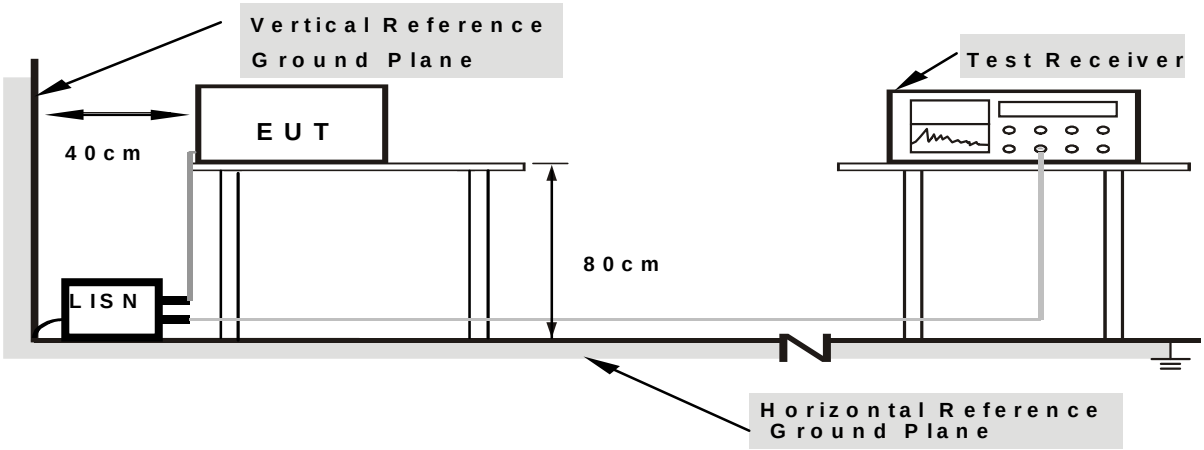
3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

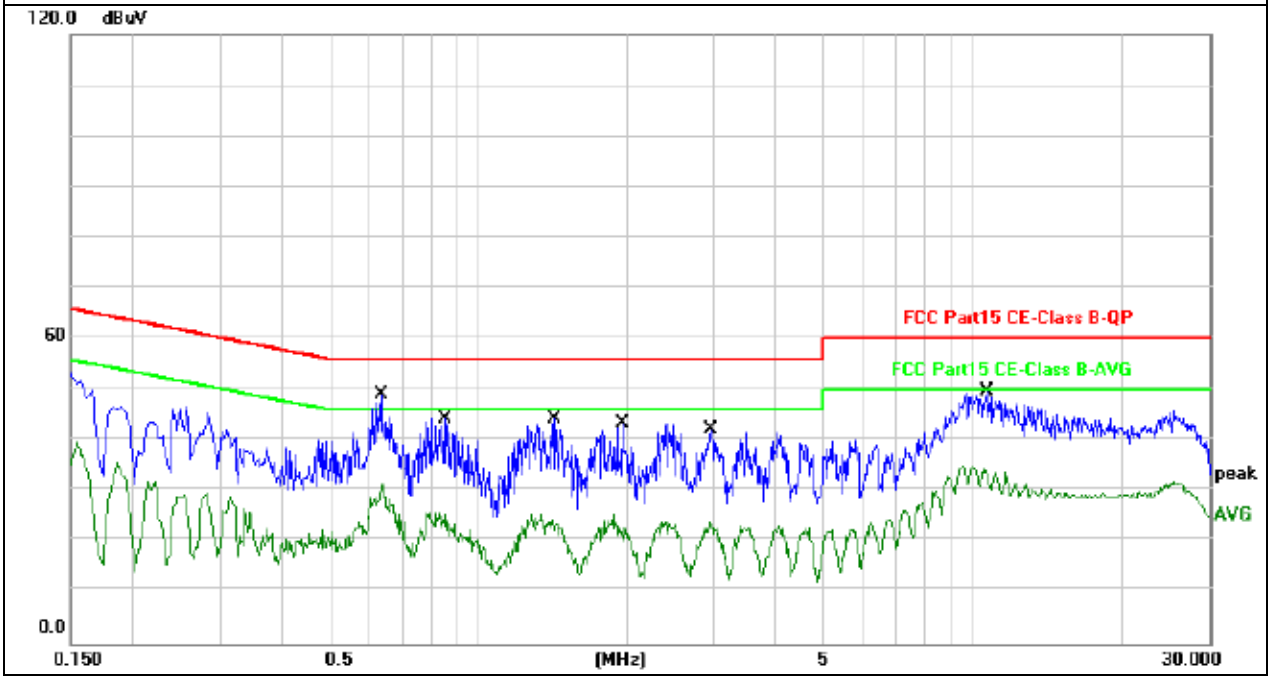
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 4

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.6340	38.91	10.13	49.04	56.00	-6.96	QP
0.6340	21.32	10.13	31.45	46.00	-14.55	AVG
0.8540	34.19	10.15	44.34	56.00	-11.66	QP
0.8540	15.29	10.15	25.44	46.00	-20.56	AVG
1.4140	34.07	10.17	44.24	56.00	-11.76	QP
1.4140	14.31	10.17	24.48	46.00	-21.52	AVG
1.9540	33.29	10.18	43.47	56.00	-12.53	QP
1.9540	12.67	10.18	22.85	46.00	-23.15	AVG
2.9460	13.67	10.19	23.86	46.00	-22.14	QP
2.9539	31.82	10.19	42.01	56.00	-13.99	AVG
10.6260	39.50	10.13	49.63	60.00	-10.37	QP
10.6260	23.48	10.13	33.61	50.00	-16.39	AVG

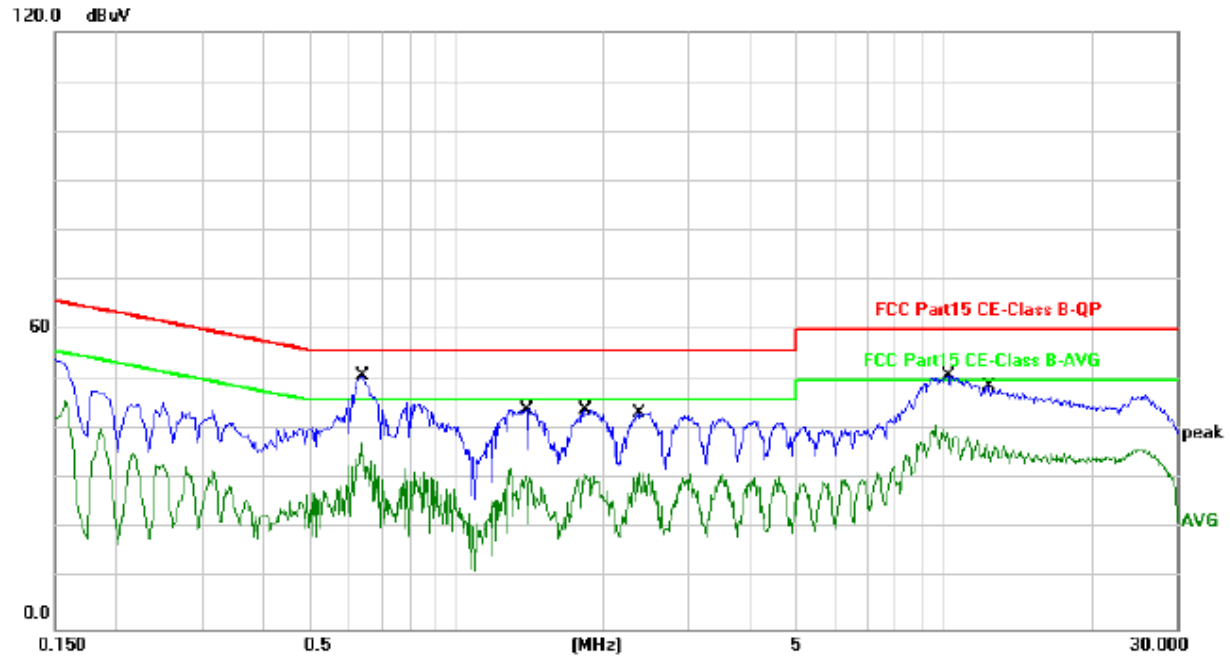
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	AC 120V/60Hz	Test Mode：	Mode 4

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.6340	40.77	10.13	50.90	56.00	-5.10	QP
0.6340	27.31	10.13	37.44	46.00	-8.56	AVG
1.3860	34.13	10.17	44.30	56.00	-11.70	QP
1.3860	20.69	10.17	30.86	46.00	-15.14	AVG
1.8420	33.83	10.18	44.01	56.00	-11.99	QP
1.8420	21.01	10.18	31.19	46.00	-14.81	AVG
2.3660	33.44	10.18	43.62	56.00	-12.38	QP
2.3660	21.26	10.18	31.44	46.00	-14.56	AVG
10.1620	40.70	10.12	50.82	60.00	-9.18	QP
10.1620	29.22	10.12	39.34	50.00	-10.66	AVG
12.2260	38.04	10.13	48.17	60.00	-11.83	QP
12.2260	26.84	10.13	36.97	50.00	-13.03	AVG

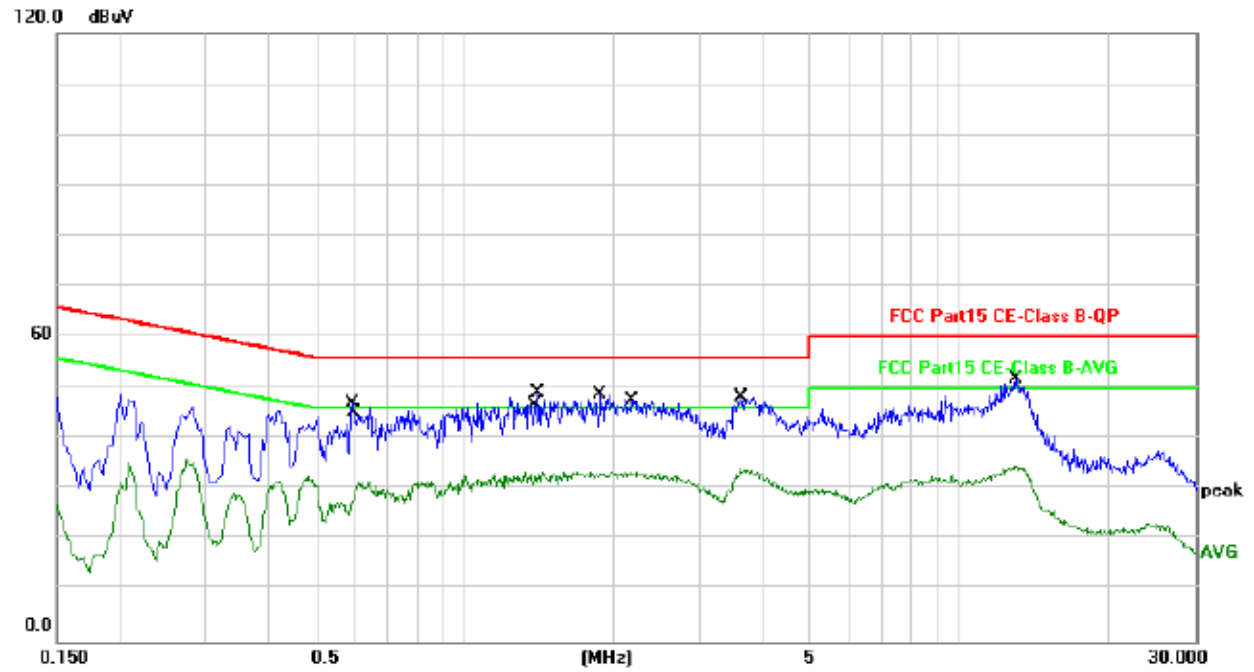
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	AC 240V/60Hz	Test Mode：	Mode 4

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.5940	36.79	10.12	46.91	56.00	-9.09	QP
0.5940	19.35	10.13	29.48	46.00	-16.52	AVG
1.3700	22.71	10.17	32.88	46.00	-13.12	QP
1.3700	38.87	10.17	49.04	56.00	-6.96	AVG
1.8780	38.56	10.18	48.74	56.00	-7.26	QP
1.8780	22.91	10.18	33.09	46.00	-12.91	AVG
2.1820	23.32	10.18	33.50	46.00	-12.50	QP
2.1820	37.46	10.18	47.64	56.00	-8.36	AVG
3.6060	23.85	10.17	34.02	46.00	-11.98	QP
3.6060	38.07	10.17	48.24	56.00	-7.76	AVG
12.9419	24.42	10.14	34.56	50.00	-15.44	QP
12.9419	41.57	10.14	51.71	60.00	-8.29	AVG

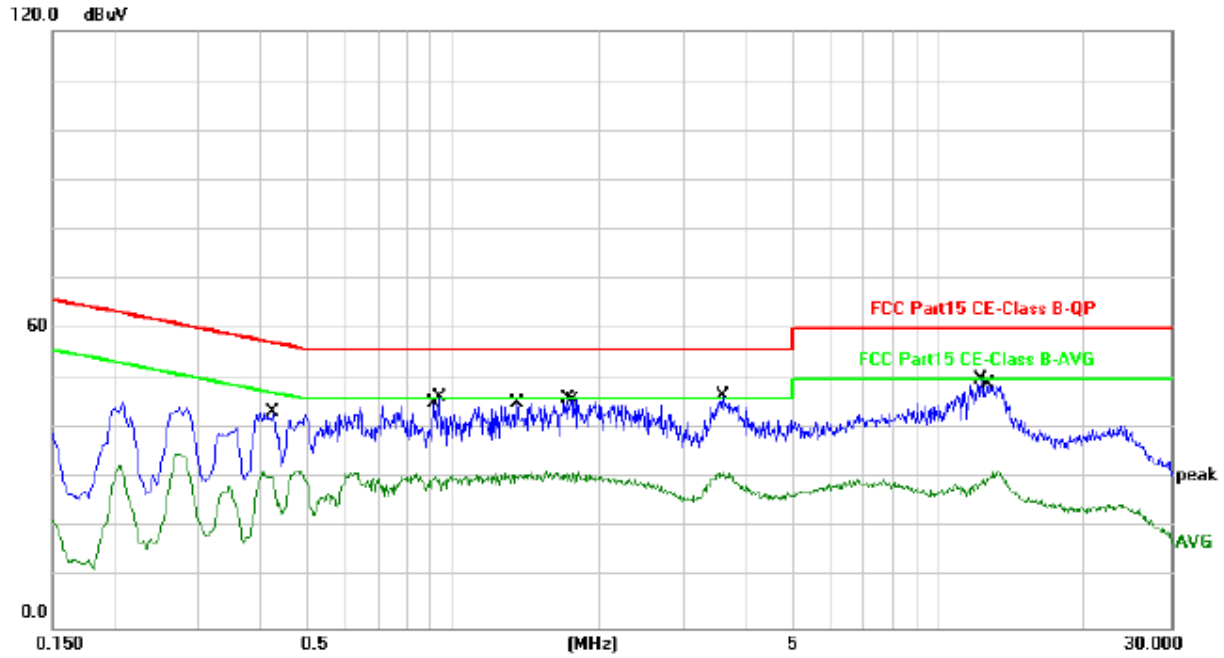
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	AC 240V/60Hz	Test Mode：	Mode 4

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.4220	20.44	10.11	30.55	47.41	-16.86	QP
0.4220	33.14	10.11	43.25	57.33	-14.08	AVG
0.9220	20.34	10.16	30.50	46.00	-15.50	QP
0.9220	36.18	10.16	46.34	56.00	-9.66	AVG
1.3420	20.68	10.17	30.85	46.00	-15.15	QP
1.3420	34.94	10.17	45.11	56.00	-10.89	AVG
1.7220	35.99	10.18	46.17	56.00	-9.83	QP
1.7220	20.99	10.18	31.17	46.00	-14.83	AVG
3.6020	36.57	10.17	46.74	56.00	-9.26	QP
3.6020	21.08	10.17	31.25	46.00	-14.75	AVG
12.2060	39.78	10.13	49.91	60.00	-10.09	QP
12.2060	20.15	10.14	30.29	50.00	-19.71	AVG

Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (dBuV/m) (at 3M)		Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80	60	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m; above 1GHz, the height was 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

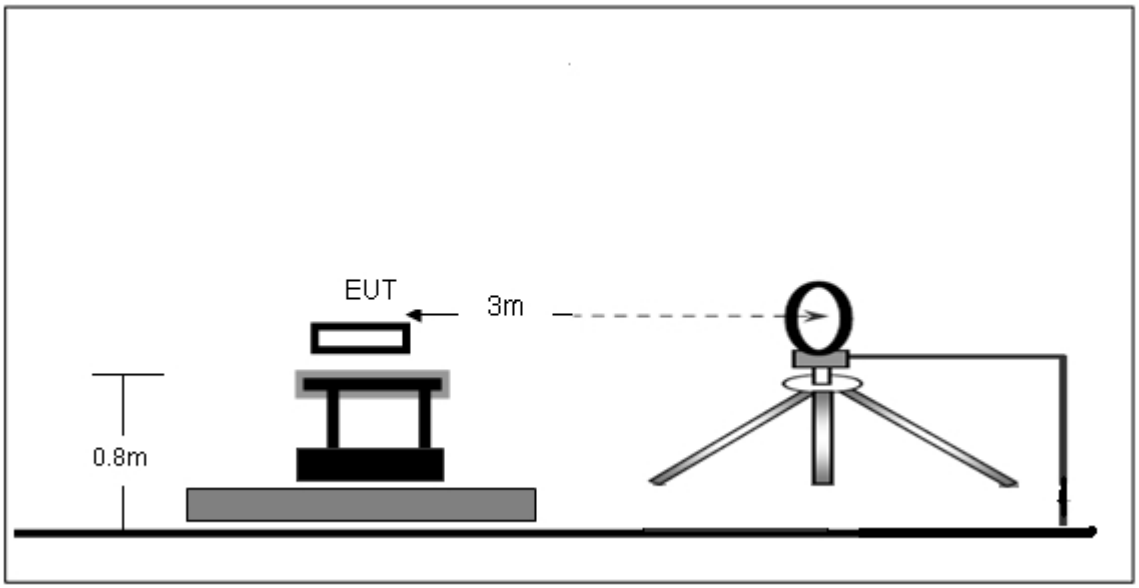
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

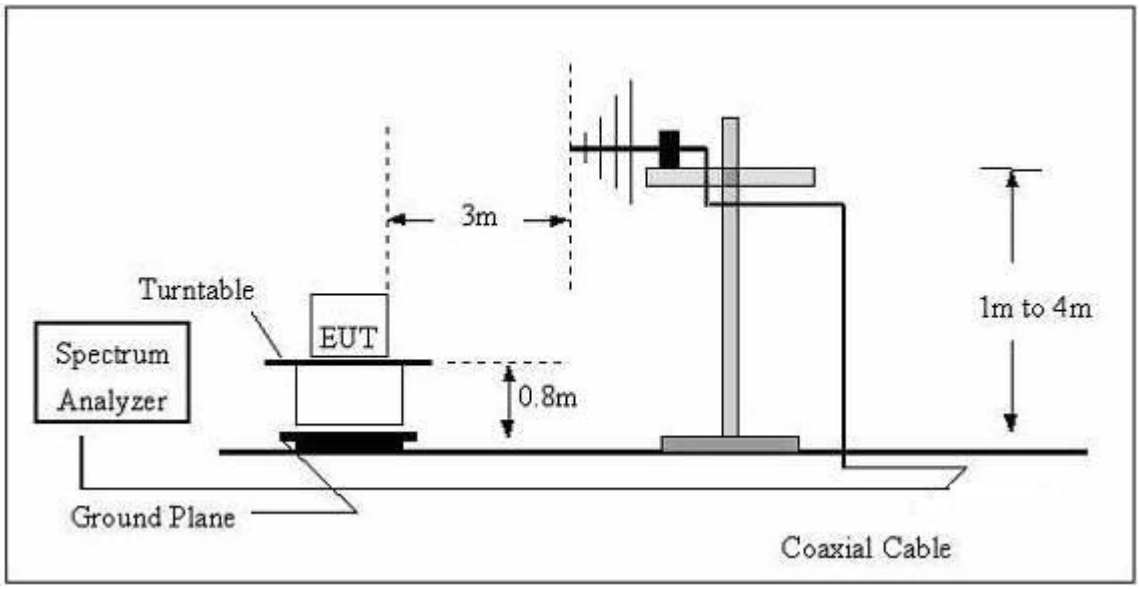
No deviation

3.2.4 TEST SETUP

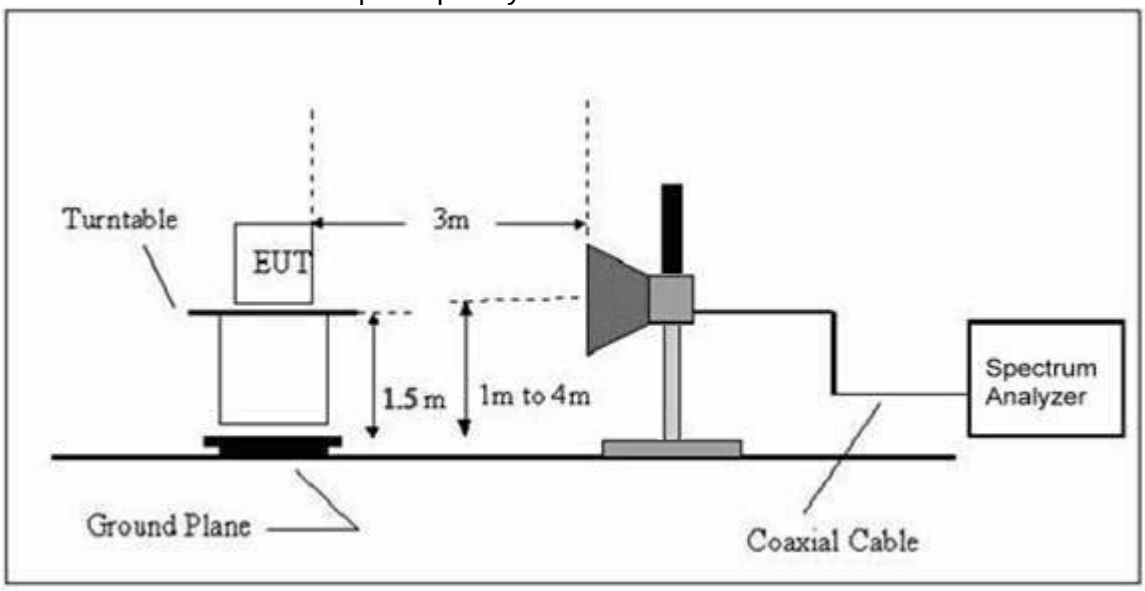
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS

Radiated Spurious Emission (Below 30MHz)

EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Polarization :	---
Test Voltage ：	AC 120V/60Hz		
Test Mode ：	TX		

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

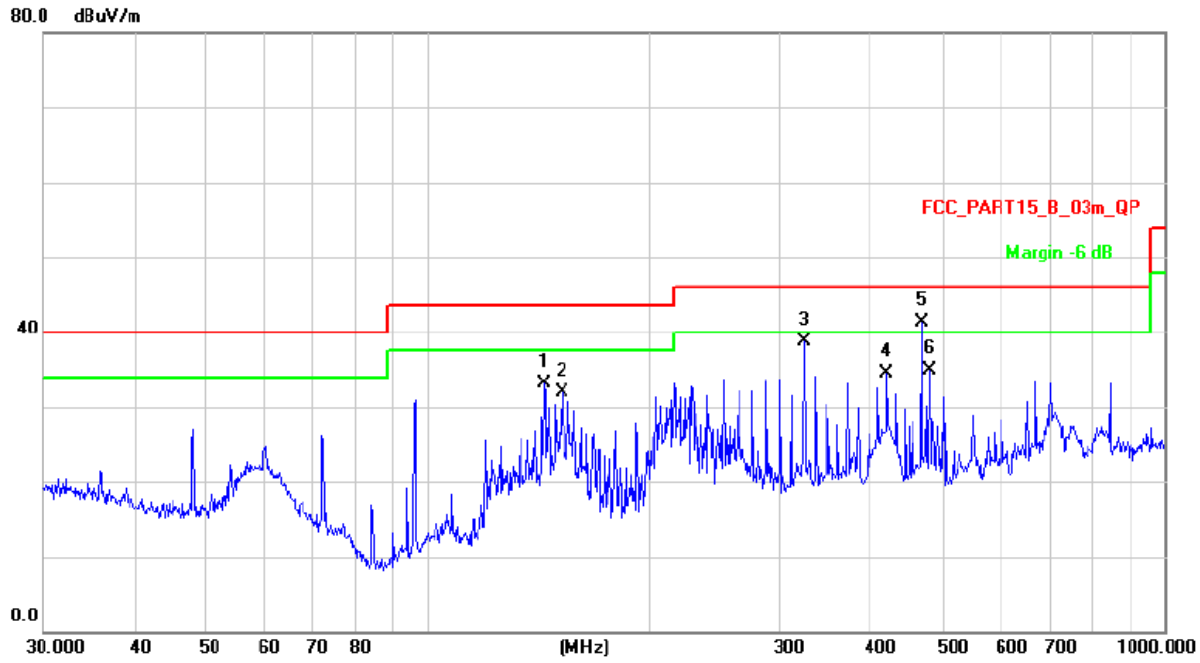
NOTE:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

Radiated Spurious Emission (Between 30MHz – 1GHz)

EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010 hPa	Polarization：	Horizontal
Test Voltage ：	AC 120V/60Hz		
Test Mode ：	TX		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
143.8295	46.21	-13.18	33.03	43.50	-10.47	QP
152.1297	44.86	-12.86	32.00	43.50	-11.50	QP
324.4561	50.58	-11.95	38.63	46.00	-7.37	QP
420.5803	44.29	-9.73	34.56	46.00	-11.44	QP
468.8762	49.89	-8.65	41.24	46.00	-4.76	QP
480.5276	43.40	-8.42	34.98	46.00	-11.02	QP

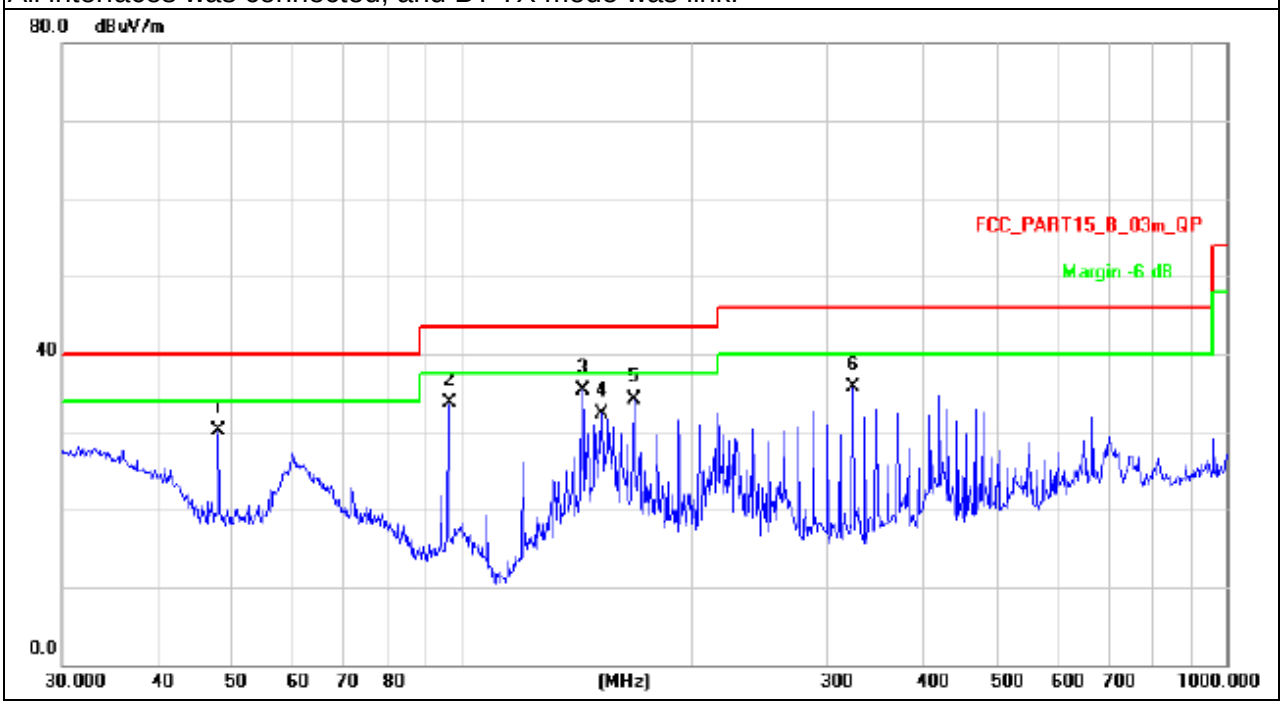
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All interfaces was connected, and BT TX mode was link.



EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010 hPa	Polarization：	Vertical
Test Voltage ：	AC 120V/60Hz		
Test Mode ：	TX		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
47.9940	40.16	-9.96	30.20	40.00	-9.80	QP
96.0986	50.53	-16.90	33.63	43.50	-9.87	QP
143.8295	48.58	-13.18	35.40	43.50	-8.10	QP
152.1297	45.18	-12.86	32.32	43.50	-11.18	QP
167.8243	47.35	-13.32	34.03	43.50	-9.47	QP
324.4561	47.60	-11.95	35.65	46.00	-10.35	QP

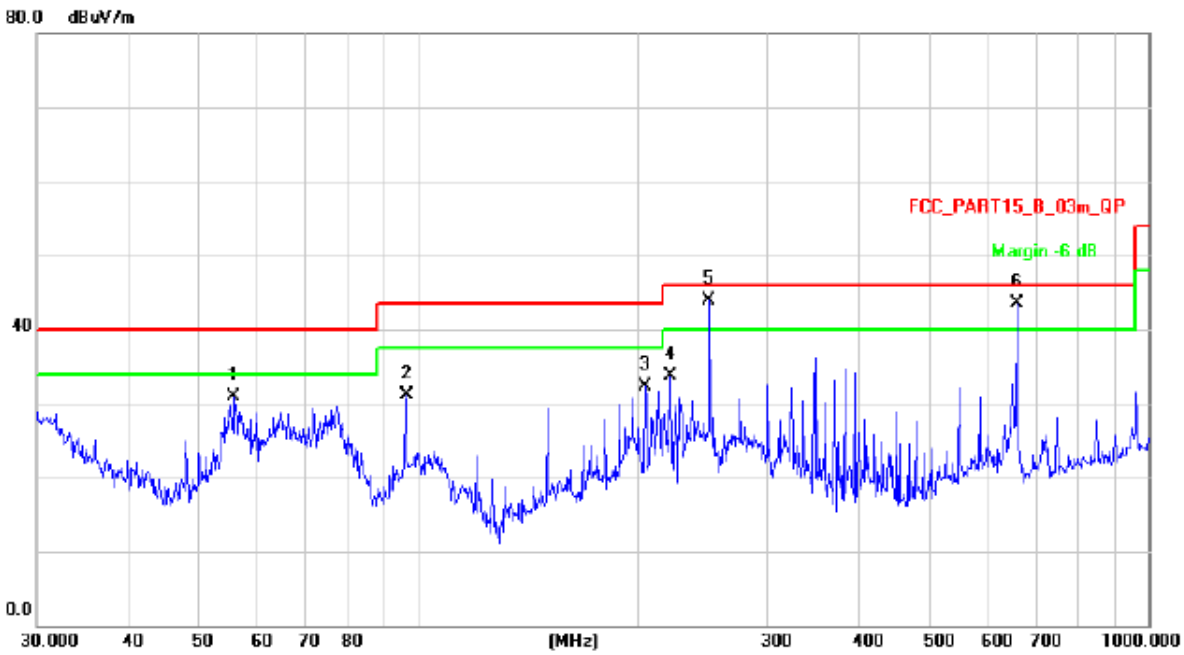
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All interfaces was connected, and BT TX mode was link.



EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010 hPa	Polarization：	Horizontal
Test Voltage ：	AC 240V/60Hz		
Test Mode ：	TX		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
55.8047	42.03	-11.19	30.84	40.00	-9.16	QP
96.0986	47.94	-16.90	31.04	43.50	-12.46	QP
204.2377	48.43	-16.08	32.35	43.50	-11.15	QP
221.3921	49.24	-15.54	33.70	46.00	-12.30	QP
250.3012	57.02	-14.19	42.83	46.00	-3.17	QP
661.1505	47.40	-4.94	42.46	46.00	-3.54	QP

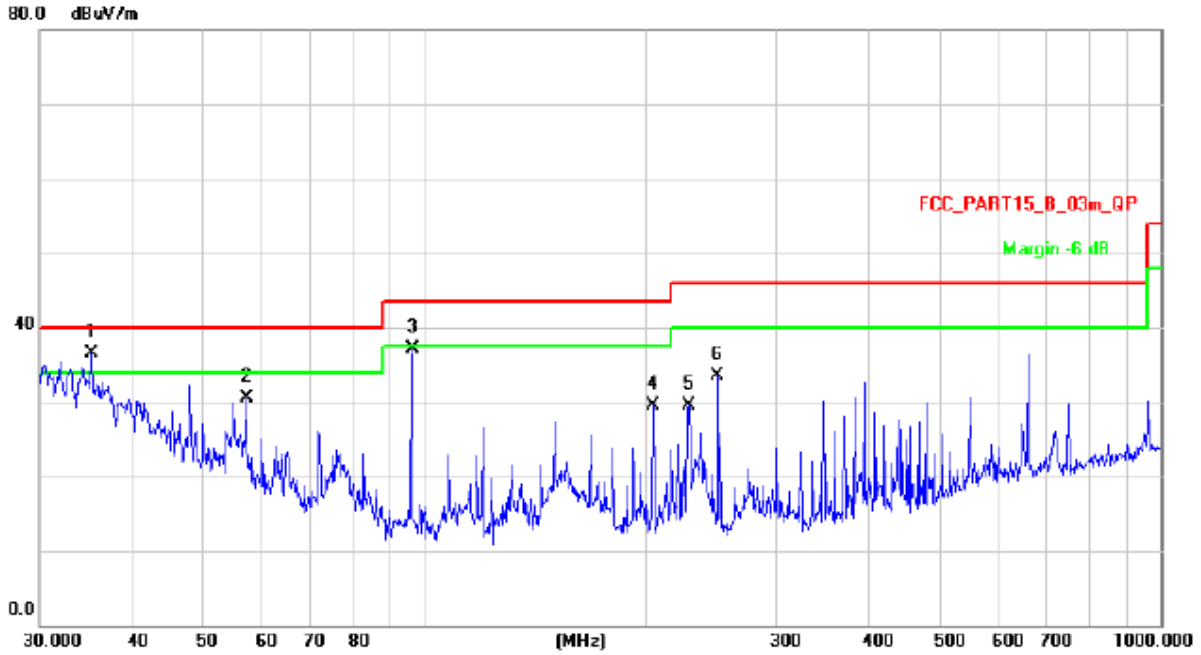
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All interfaces was connected, and BT TX mode was link.



EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010 hPa	Polarization：	Vertical
Test Voltage ：	AC 240V/60Hz		
Test Mode ：	TX		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
35.2511	45.02	-8.53	36.49	40.00	-3.51	QP
57.1914	41.81	-11.30	30.51	40.00	-9.49	QP
96.0986	53.99	-16.90	37.09	43.50	-6.41	QP
204.2377	45.61	-16.08	29.53	43.50	-13.97	QP
228.4904	44.63	-15.14	29.49	46.00	-16.51	QP
250.3010	47.73	-14.19	33.54	46.00	-12.46	QP

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
All interfaces was connected, and BT TX mode was link.



Radiated Spurious Emission (1GHz to 10th harmonics)
(Scan with GFSK, π/4-DQPSK,8DPSK,the worst casw is BDR Mode (GFSK)

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (2402 MHz)							
1237.5	64.42	-19.14	45.28	74	-28.72	peak	Vertical
2095.9	59.81	-16.43	43.38	74	-30.62	peak	Vertical
3583.3	58.73	-11.63	47.1	74	-26.9	peak	Vertical
4804.2	52.62	-3.64	48.98	74	-25.02	peak	Vertical
1687.9	63.52	-19.14	44.38	74	-29.62	peak	Horizontal
1895.5	61.46	-16.43	45.03	74	-28.97	peak	Horizontal
3383.2	55.33	-11.63	43.7	74	-30.3	peak	Horizontal
4804.3	50.94	-3.64	47.3	74	-26.7	peak	Horizontal
Mid Channel (2441 MHz)							
1441.6	63.55	-17.48	46.07	74	-27.93	peak	Vertical
2213.4	57.06	-12.92	44.14	74	-29.86	peak	Vertical
3052.8	55.13	-11.73	43.4	74	-30.6	peak	Vertical
4882.4	53.58	-3.68	49.9	74	-24.1	peak	Vertical
1857.3	65.89	-19.14	46.75	74	-27.25	peak	Horizontal
2400.6	62.78	-16.06	46.72	74	-27.28	peak	Horizontal
2808.3	59.45	-12.77	46.68	74	-27.32	peak	Horizontal
4882.2	51.23	-3.68	47.55	74	-26.45	peak	Horizontal
High Channel (2480 MHz)							
1363.5	66.64	-18.54	48.1	74	-25.9	peak	Vertical
2132.4	64.82	-12.87	51.95	74	-22.05	peak	Vertical
3223.2	56.91	-11.43	45.48	74	-28.52	peak	Vertical
4960.1	52.56	-3.59	48.97	74	-25.03	peak	Vertical
1824.5	67.65	-19.14	48.51	74	-25.49	peak	Horizontal
2378.8	64.92	-17.48	47.44	74	-26.56	peak	Horizontal
3663.4	62.68	-14.64	48.04	74	-25.96	peak	Horizontal
4961.5	51.82	-3.59	48.23	74	-25.77	peak	Horizontal

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Meter Reading + Factor
Margin = Emission Level - Limit

Radiated band edge:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
GFSK							
2400	53.24	-13.06	40.18	74	-33.82	peak	Vertical
2400	51.85	-13.06	38.79	74	-35.21	peak	Horizontal
2483.5	49.83	-12.78	37.05	74	-36.95	peak	Vertical
2483.5	49.21	-12.78	36.43	74	-37.57	peak	Horizontal
π/4-DQPSK							
2400	54.25	-13.06	41.19	74	-32.81	peak	Vertical
2400	53.25	-13.06	40.19	74	-33.81	peak	Horizontal
2483.5	51.24	-12.78	38.46	74	-35.54	peak	Vertical
2483.5	52.67	-12.78	39.89	74	-34.11	peak	Horizontal
8DPSK							
2400	51.73	-13.06	38.67	74	-35.33	peak	Vertical
2400	50.56	-13.06	37.5	74	-36.5	peak	Horizontal
2483.5	49.83	-12.78	37.05	74	-36.95	peak	Vertical
2483.5	47.97	-12.78	35.19	74	-38.81	peak	Horizontal

NOTE: 1.The result(PK) less than AV limite,No need shown AV result.
2.Hopping enabled and disabled have evaluated,and the worest data was reported

4. NUMBER OF HOPPING CHANNEL

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW ≥ 1% of the span
VB	VBW ≥ RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

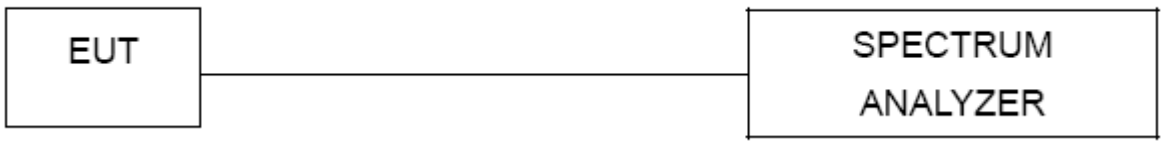
4.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = Auto.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



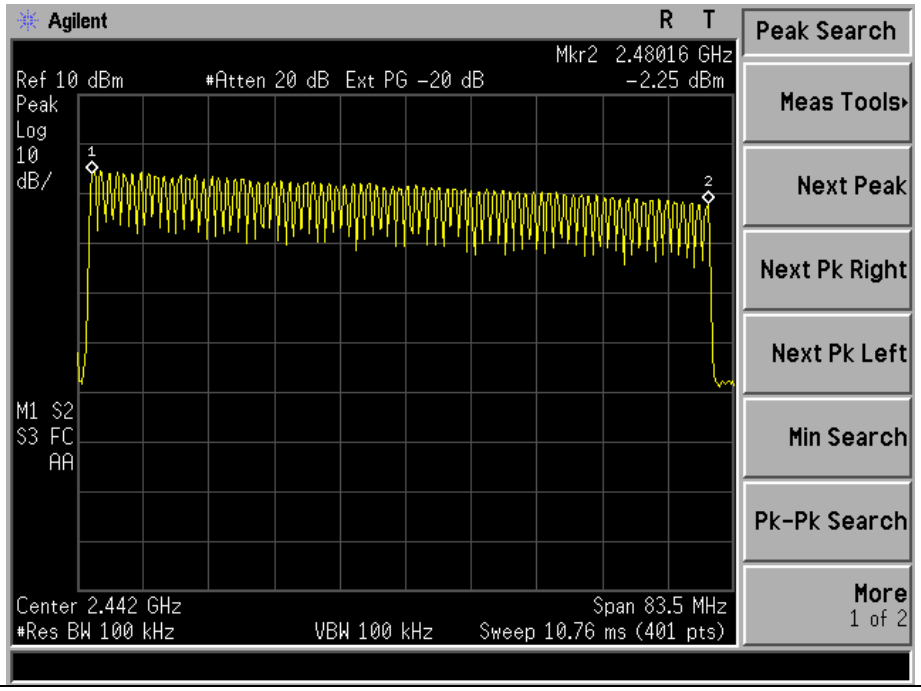
4.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1015 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	Hopping Mode		

Number of Hopping Channel	79



5. AVERAGE TIME OF OCCUPANCY

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

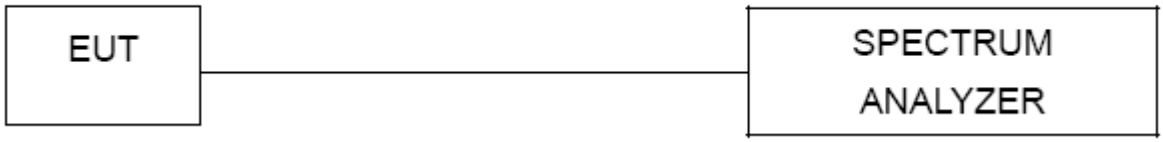
5.1.1 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.
g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
h. Measure the maximum time duration of one single pulse.
i. A Period Time = (channel number)*0.4
DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)
DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)
DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

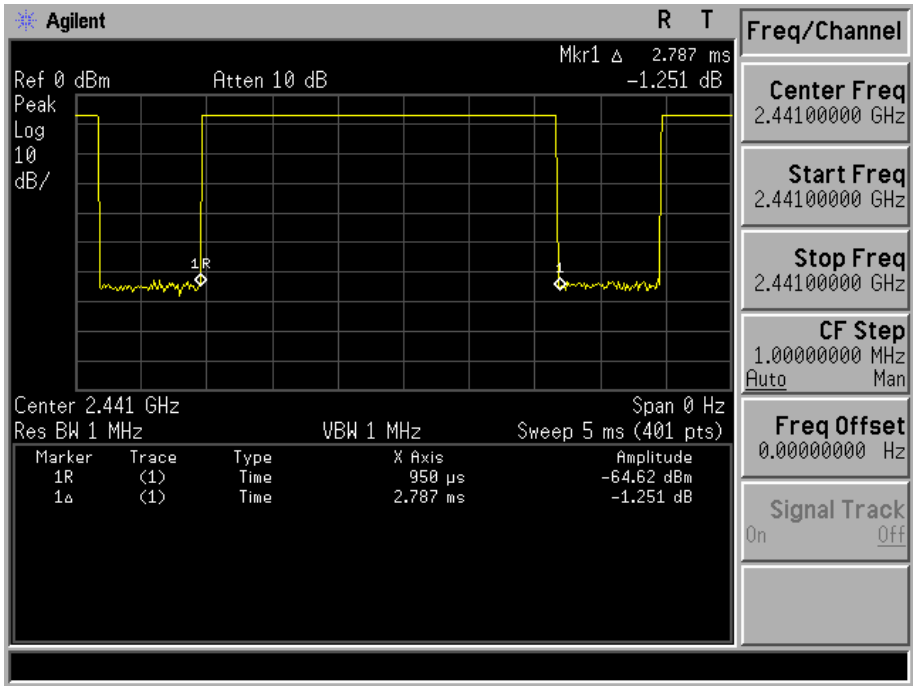
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

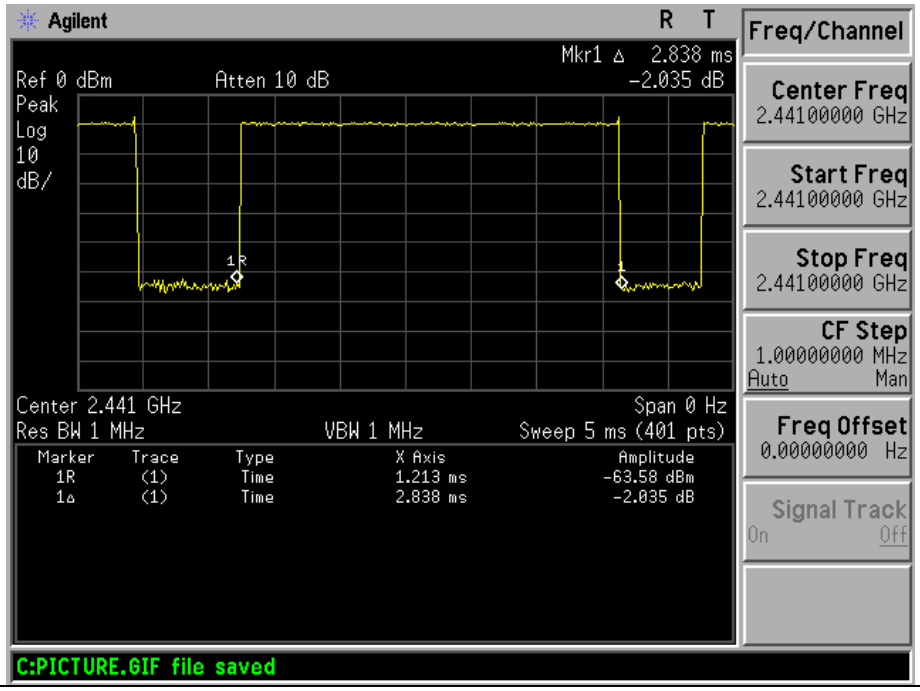
EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH39-DH5, 2DH5, 3DH5		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH5	2441 MHz	2.88	0.31	0.4
2DH5	2441 MHz	2.84	0.30	0.4
3DH5	2441 MHz	2.86	0.31	0.4

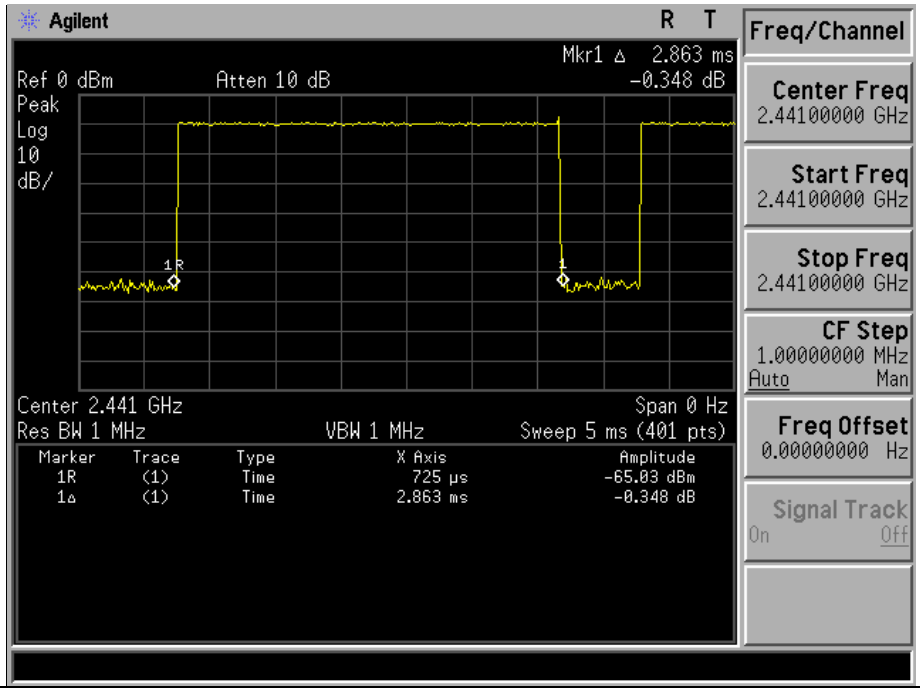
CH39-DH5



CH39-2DH5



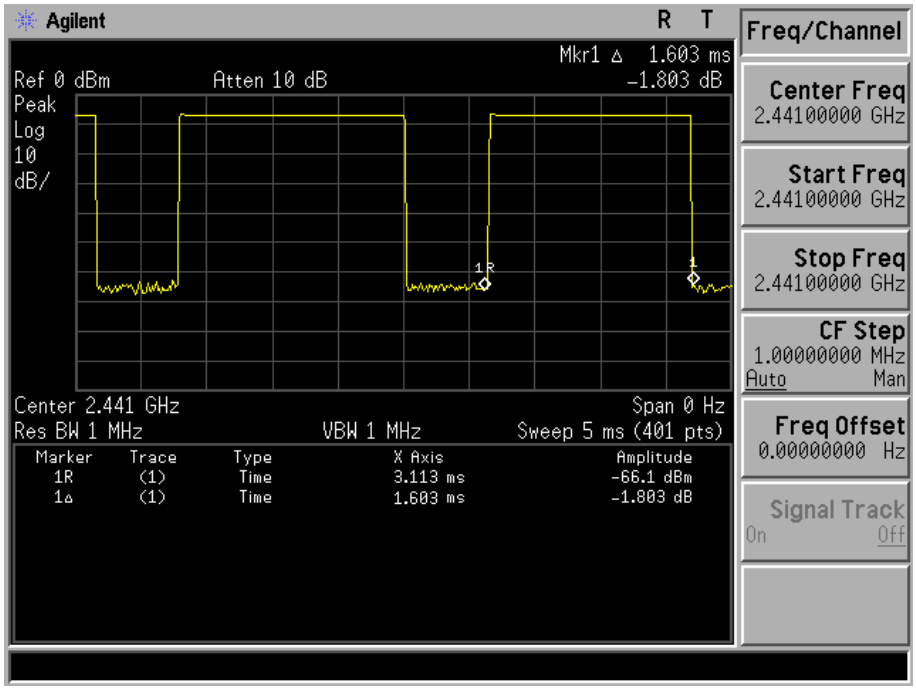
CH39-3DH5



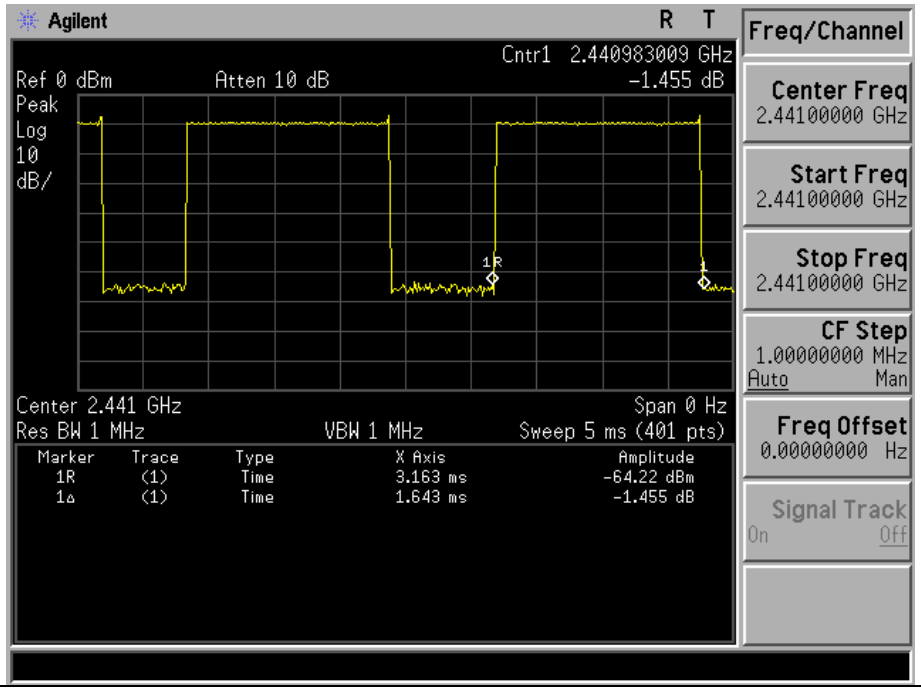
EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH39-DH3, 2DH3, 3DH3		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH3	2441 MHz	1.60	0.26	0.4
2DH3	2441 MHz	1.64	0.26	0.4
3DH3	2441 MHz	1.58	0.25	0.4

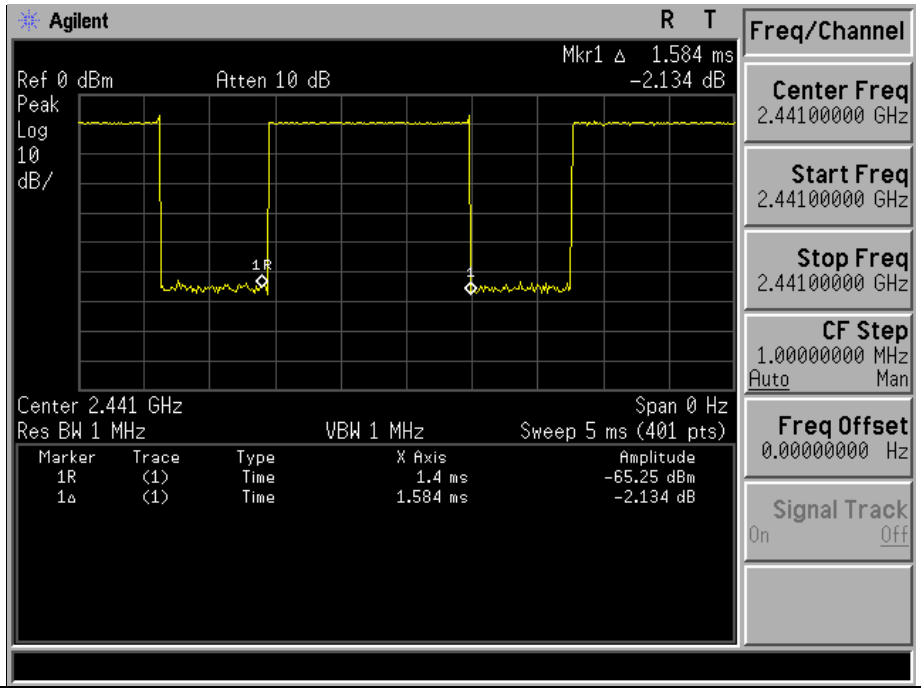
CH39-DH3



CH39-2DH3



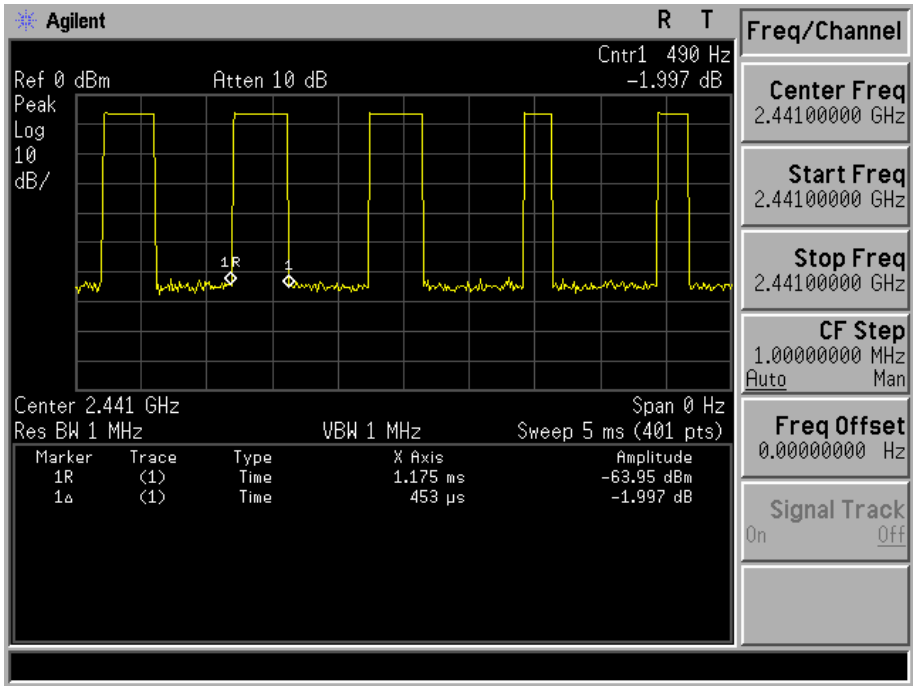
CH39-3DH3



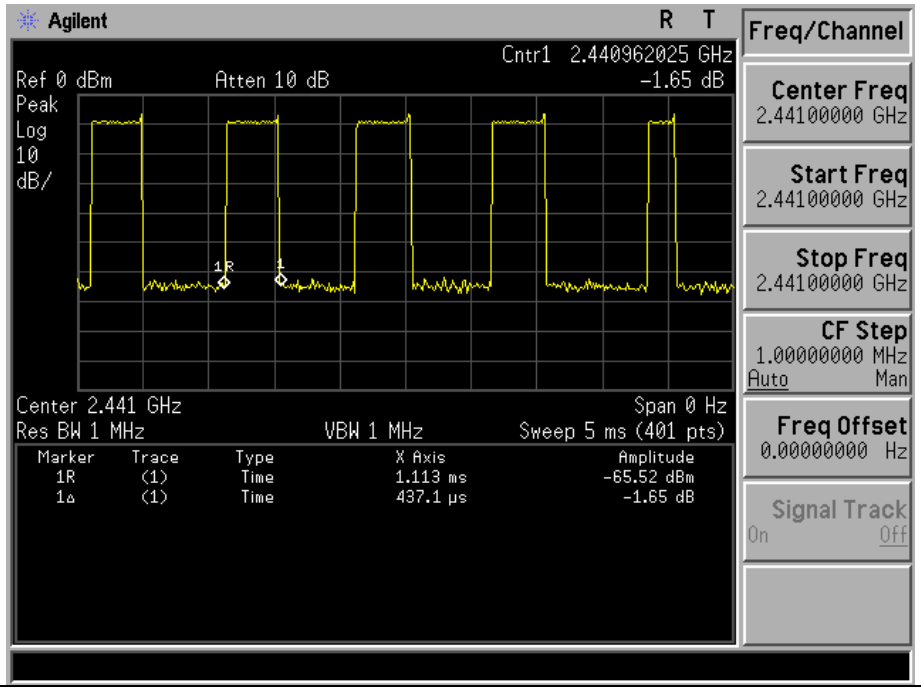
EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH39-DH1, 2DH1, 3DH1		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH1	2441 MHz	0.45	0.14	0.4
2DH1	2441 MHz	0.44	0.14	0.4
3DH1	2441 MHz	0.47	0.15	0.4

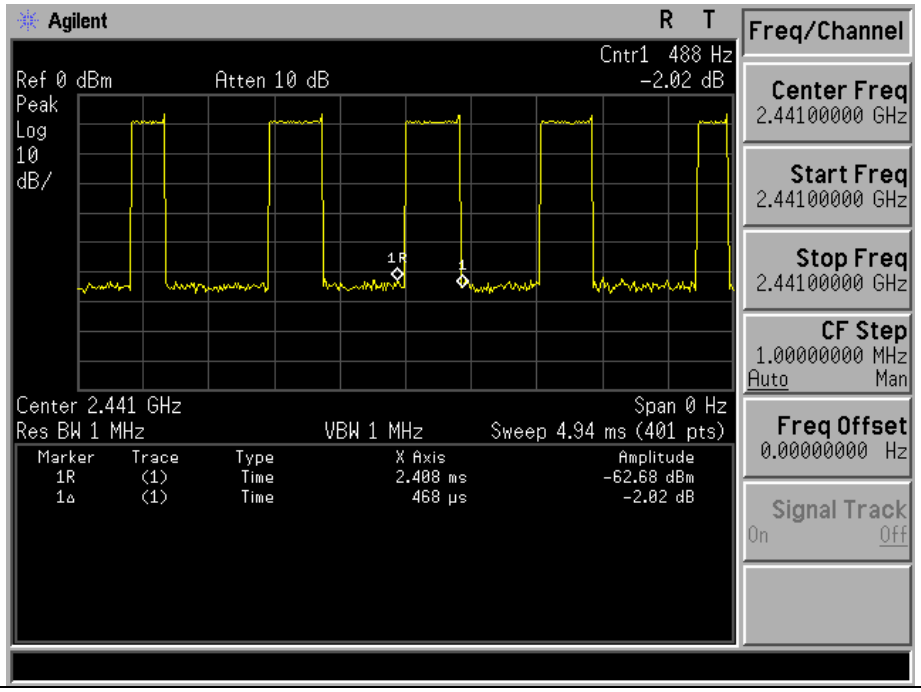
CH39-DH1



CH39-2DH1



CH39-3DH1



6. HOPPING CHANNEL SEPARATION MEASUREMENT

6.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	100 kHz (Channel Separation)
VB	300 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

6.1.1 TEST PROCEDURE

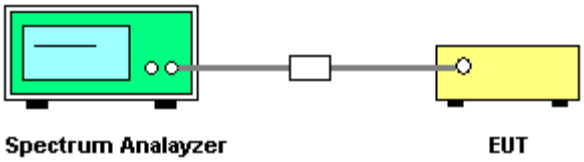
a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.

b. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised for channel separation measurement.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

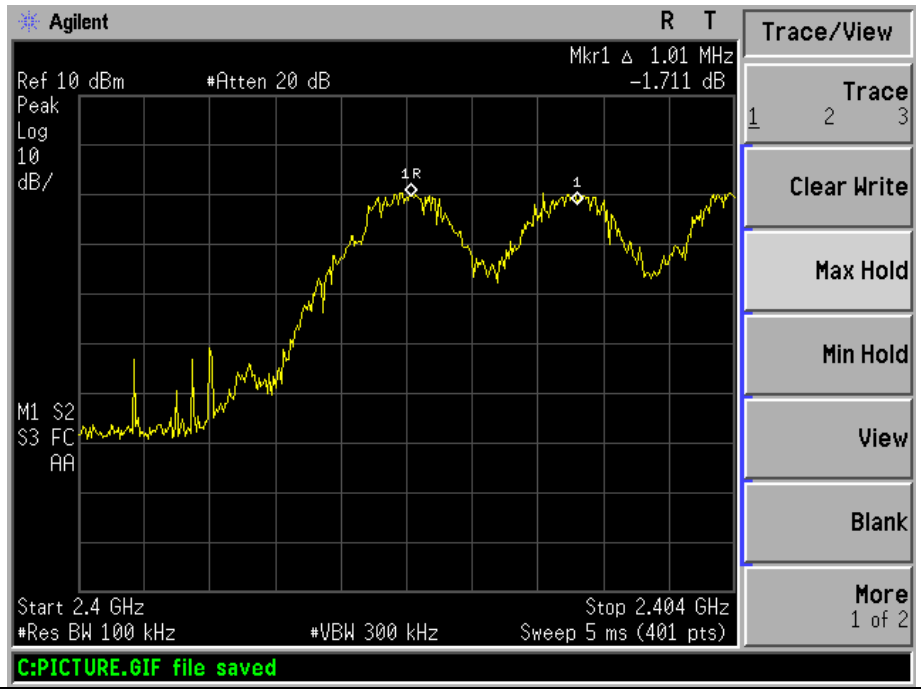
6.1.5 TEST RESULTS

EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00 / CH39 /CH78 (1Mbps Mode)		

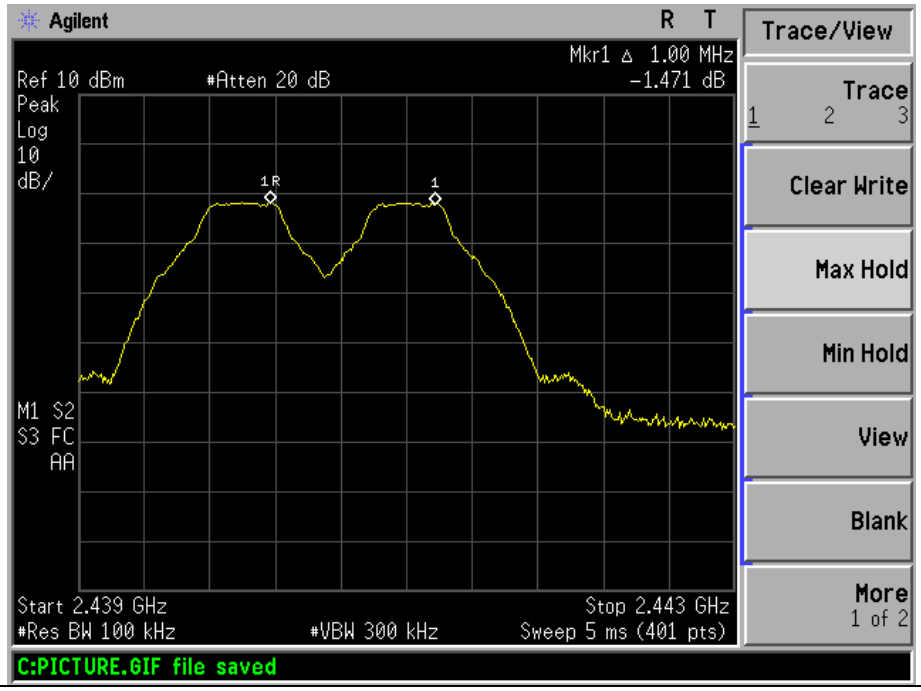
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.01	**Complies**
2441 MHz	1.00	**Complies**
2480 MHz	1.01	**Complies**

Ch. Separation Limits: >2/3 20dB bandwidth

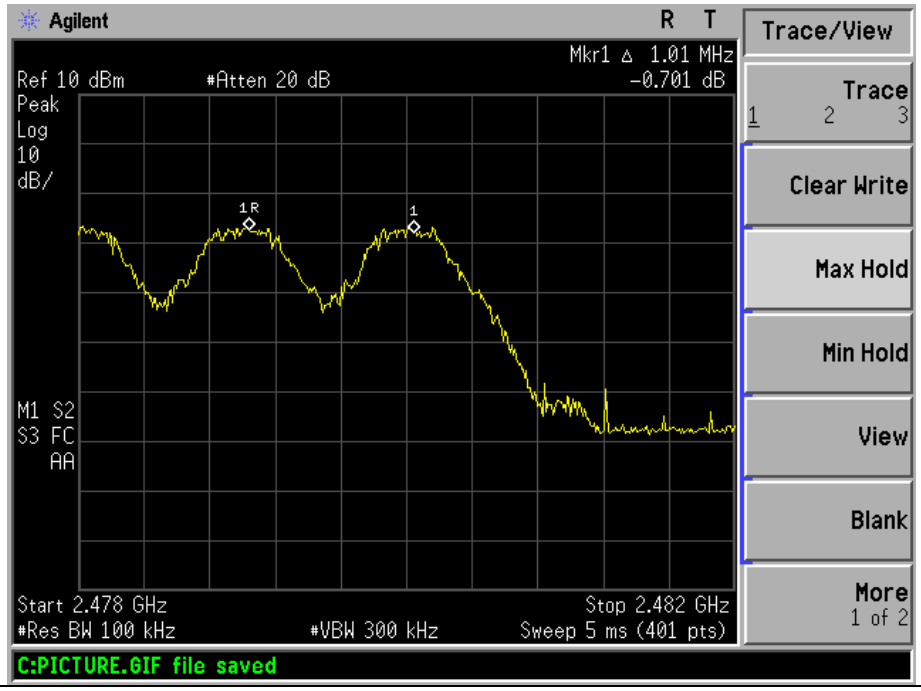
CH00 -1Mbps



CH39 -1Mbps



CH78 -1Mbps

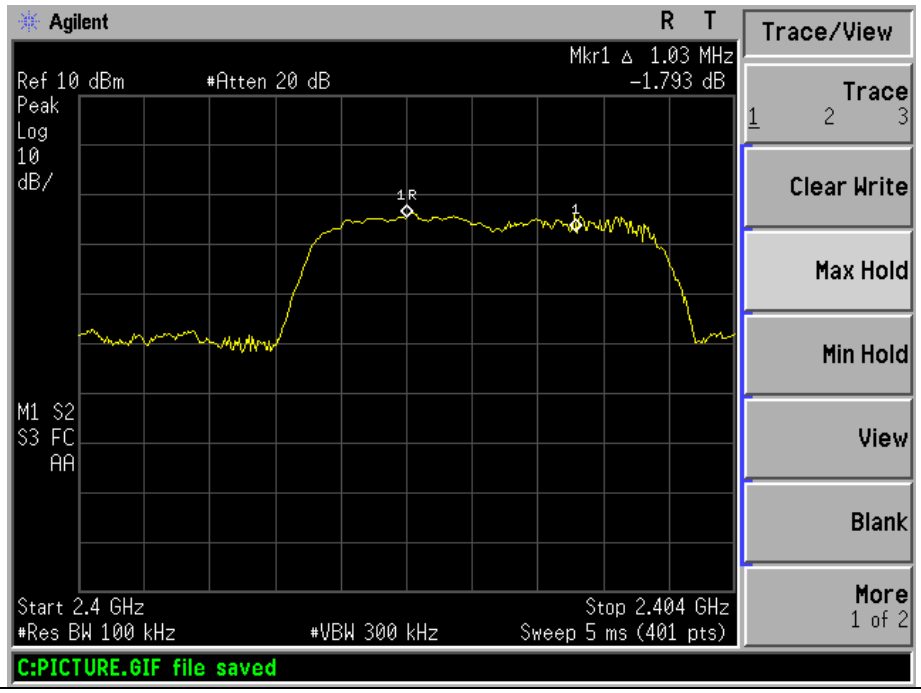


EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00 / CH39 /CH78 (2Mbps Mode)		

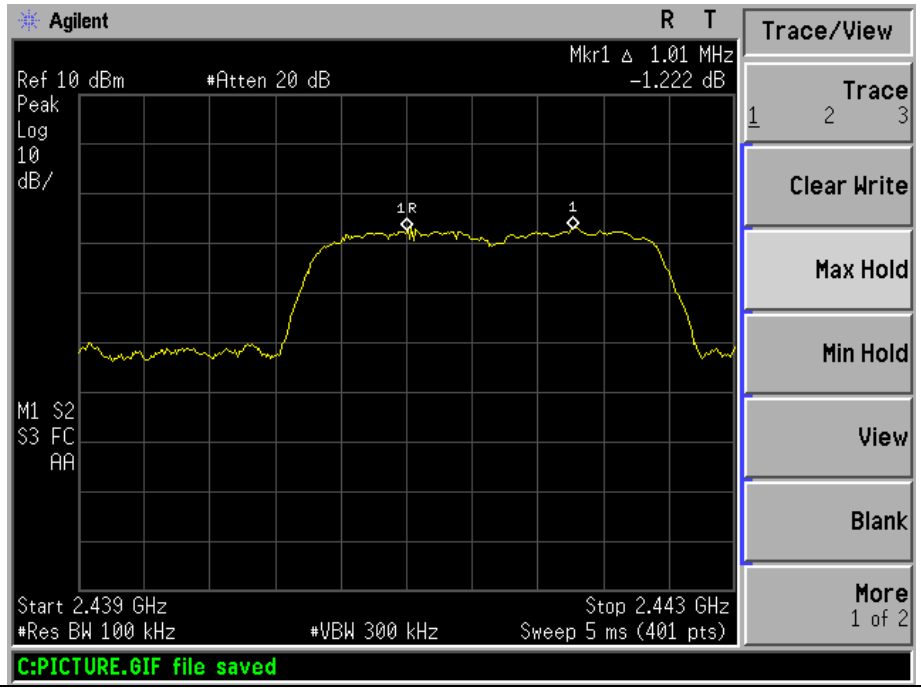
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.03	**Complies**
2441 MHz	1.01	**Complies**
2480 MHz	1.03	**Complies**

Ch. Separation Limits: >20dB bandwidth

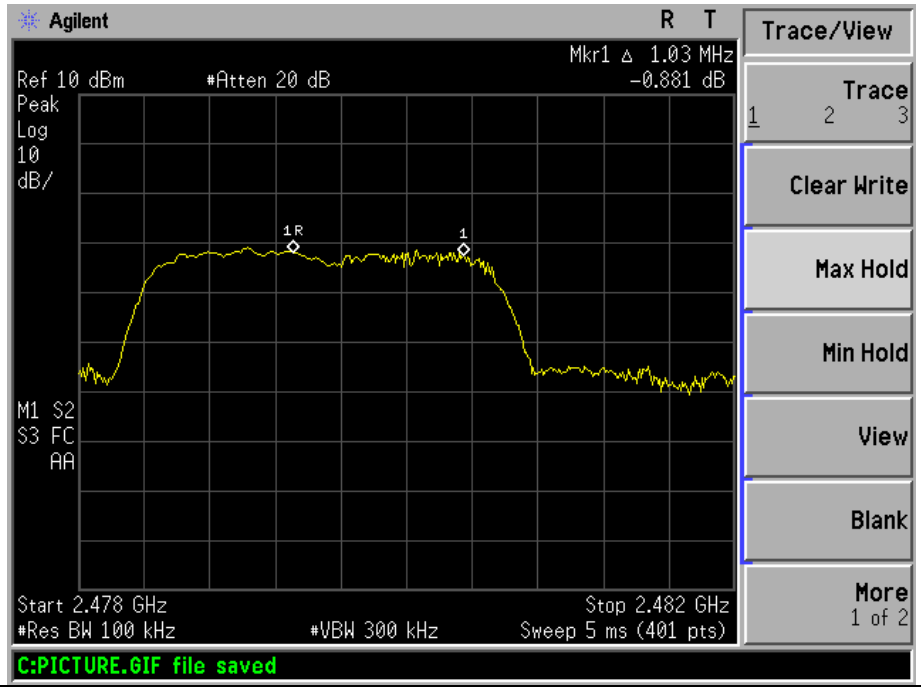
CH00 -2Mbps



CH39 -2Mbps



CH78 -2Mbps

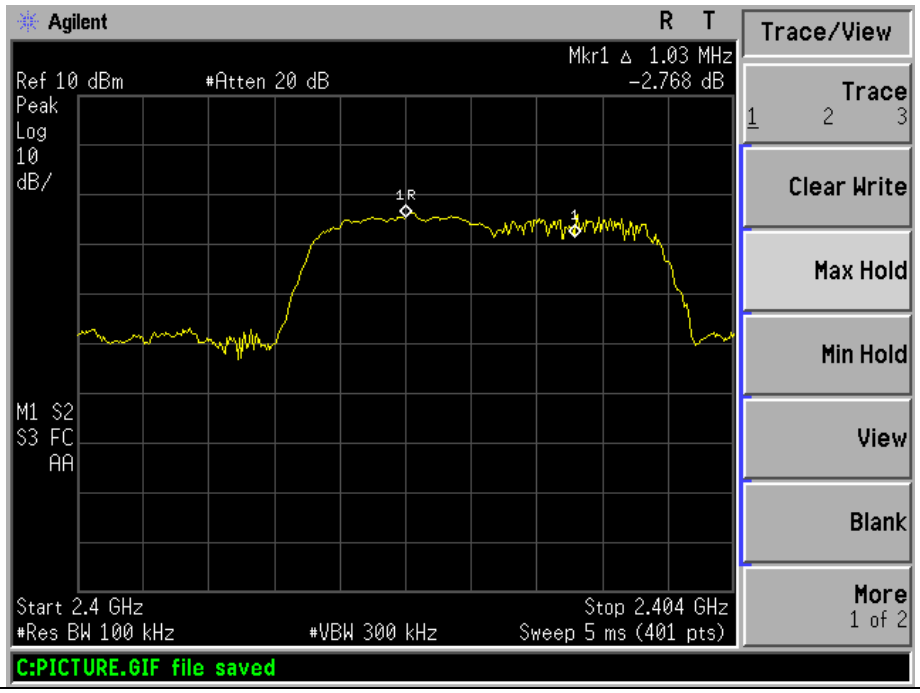


EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00 / CH39 /CH78 (3Mbps Mode)		

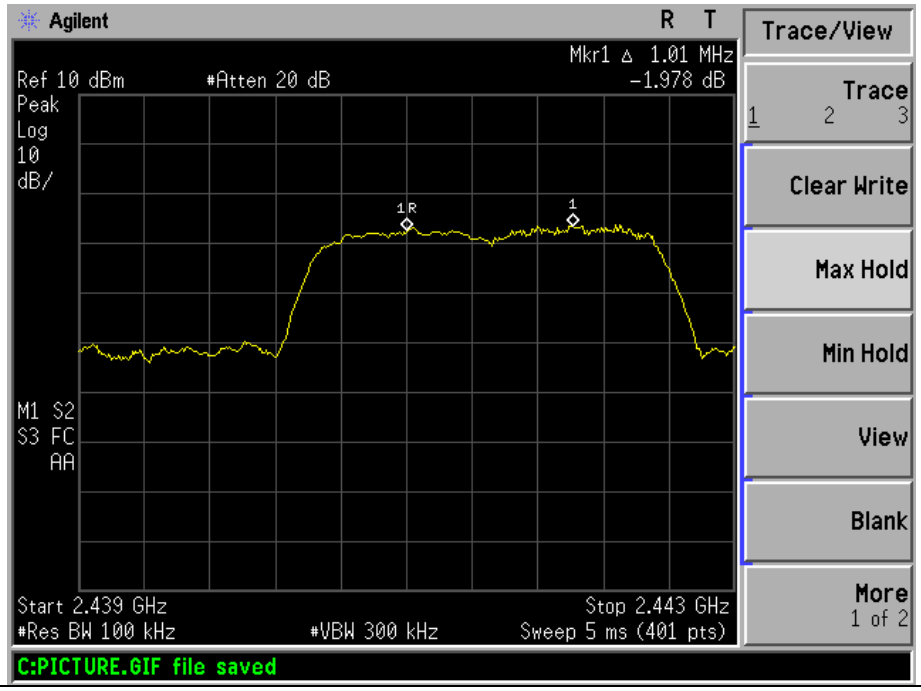
Frequency	Ch. Separation (MHz)	Result
2402 MHz	1.03	**Complies**
2441 MHz	1.01	**Complies**
2480 MHz	1.03	**Complies**

Ch. Separation Limits: >20dB bandwidth

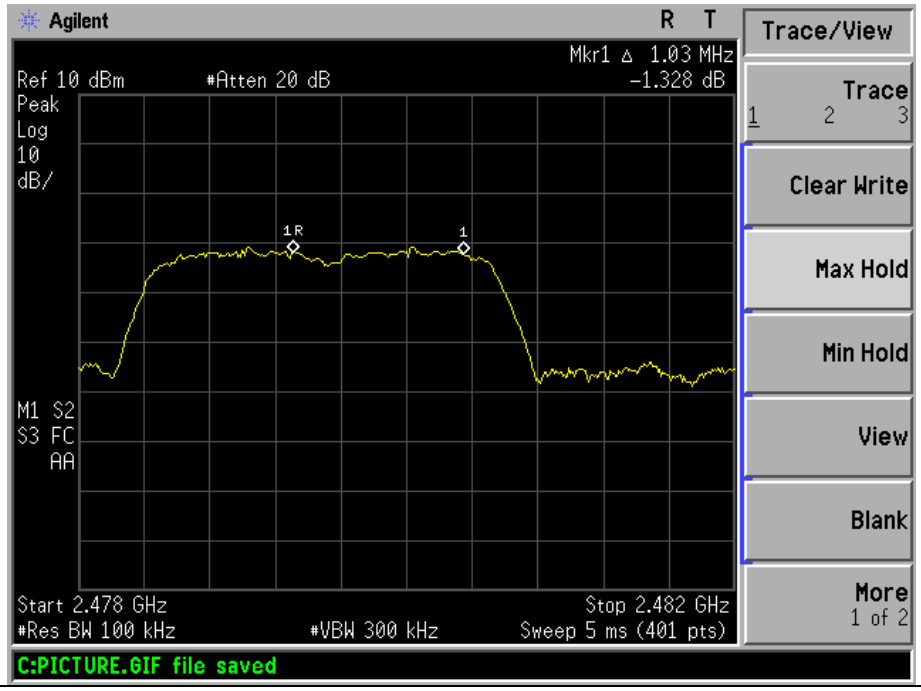
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



7. BANDWIDTH TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	1% of the 20 dB bandwidth
VB	≥RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

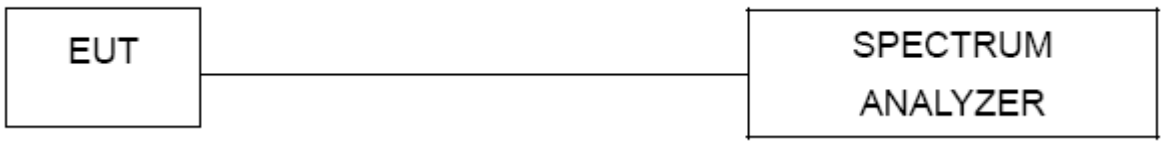
7.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 1% of the 20 dB bandwidth, VBW≥ RBW, Sweep time = Auto.

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT OPERATION CONDITIONS

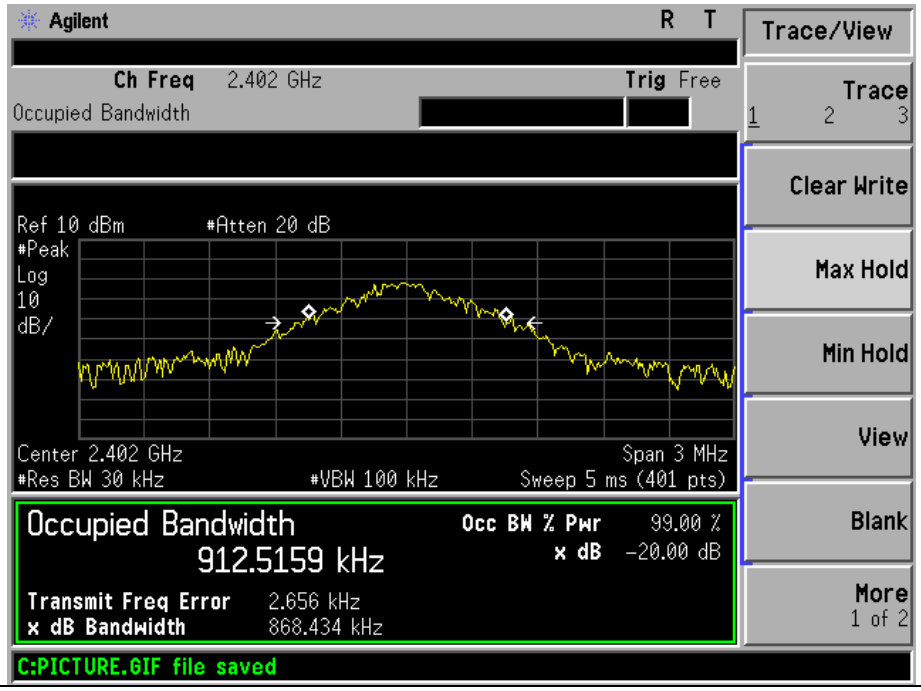
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.1.5 TEST RESULTS

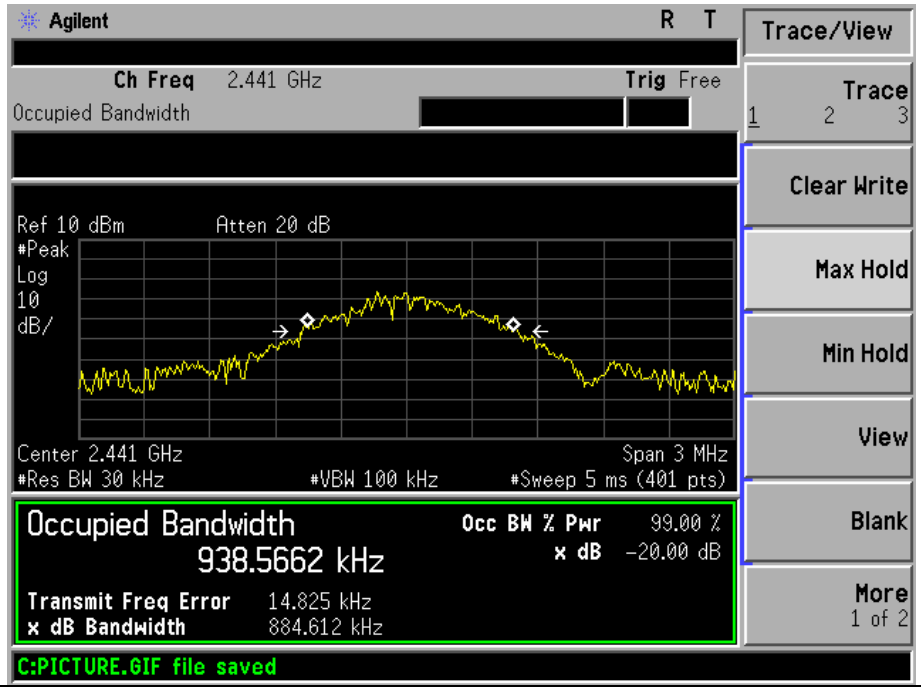
EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00 / CH39 /C78**(1Mbps)**		

Frequency	20dB Bandwidth (kHz)	Result
2402 MHz	868.434	**PASS**
2441 MHz	884.612	**PASS**
2480 MHz	889.069	**PASS**

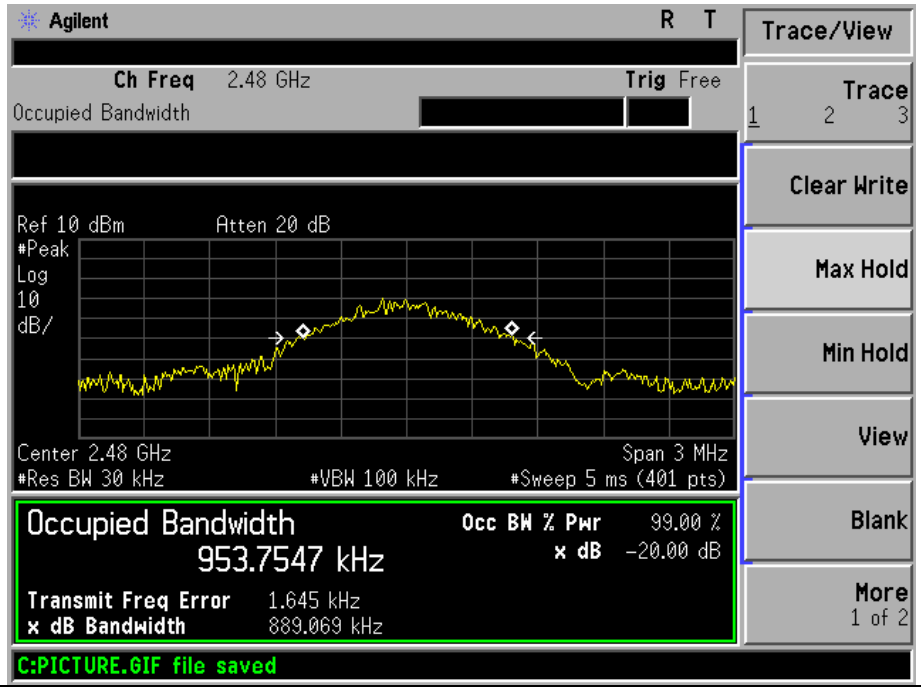
CH00 -1Mbps



CH39 -1Mbps



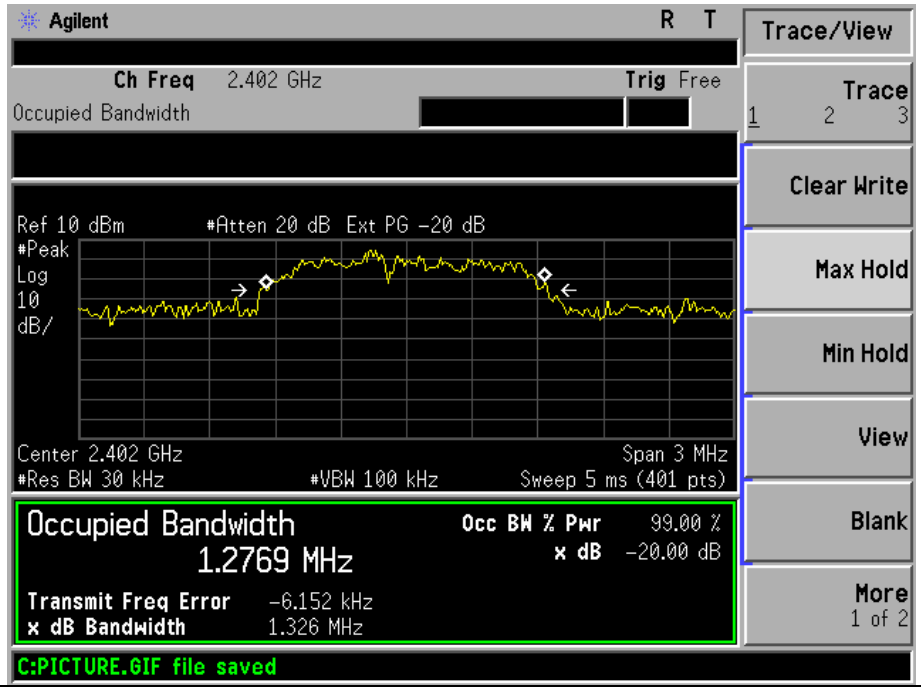
CH78 -1Mbps



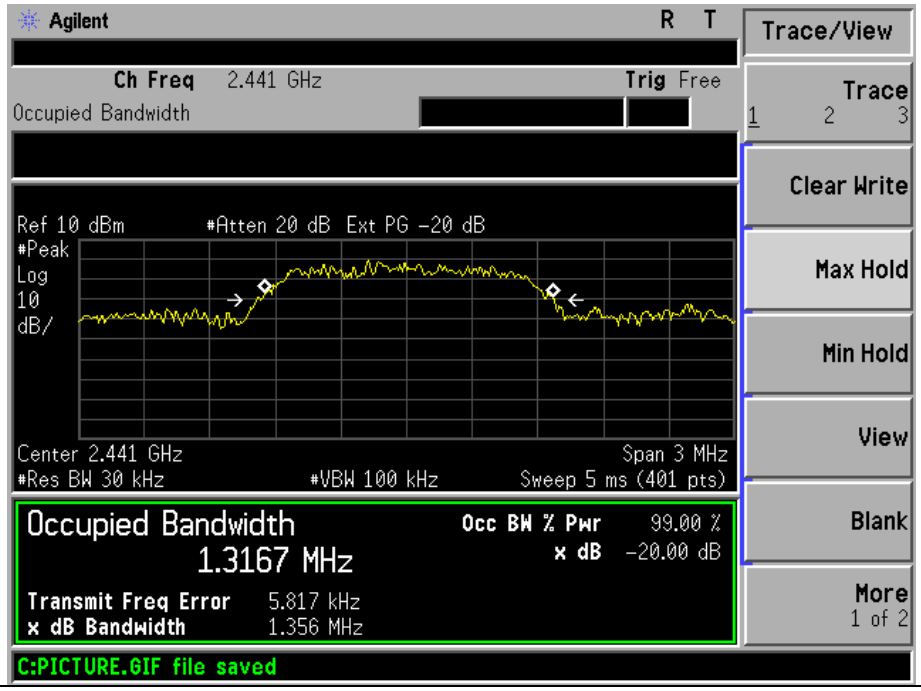
EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00 / CH39 /C78**(2Mbps)**		

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.326	**PASS**
2441 MHz	1.356	**PASS**
2480 MHz	1.365	**PASS**

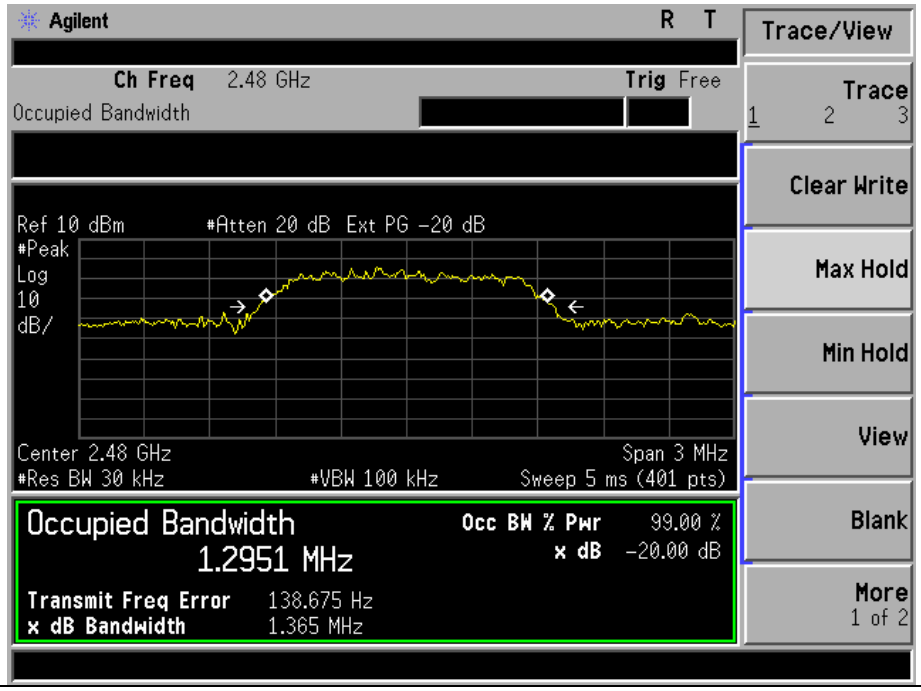
CH00 -2Mbps



CH39 -2Mbps



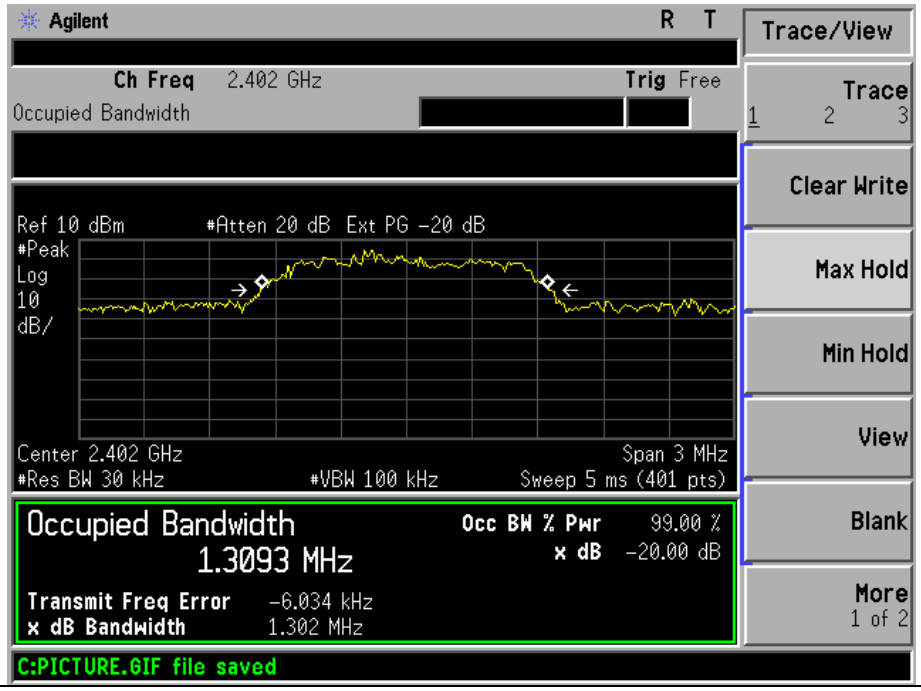
CH78 -2Mbps



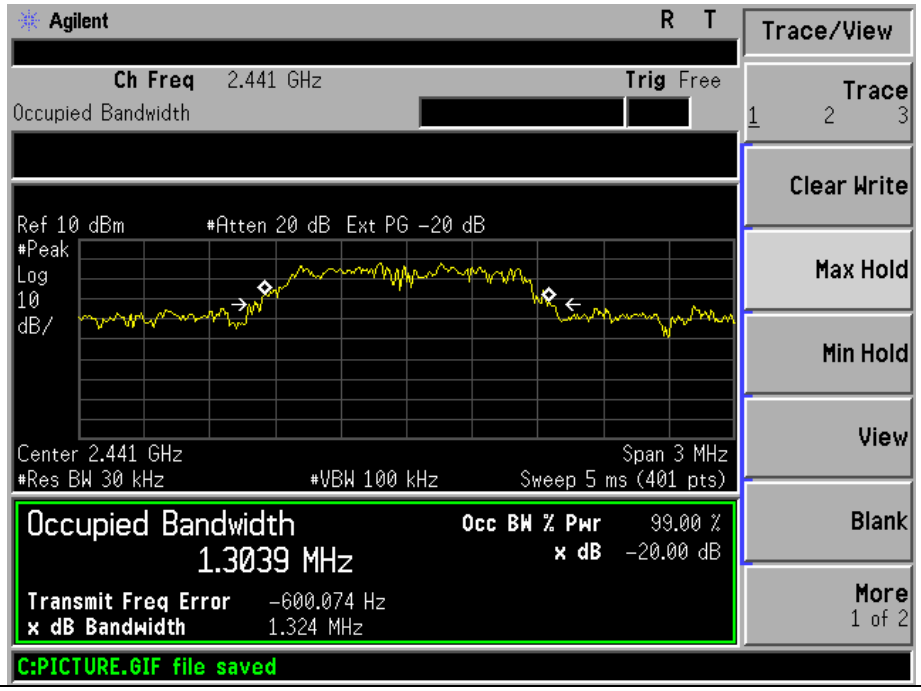
EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00 / CH39 /C78**(3Mbps)**		

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.302	**PASS**
2441 MHz	1.324	**PASS**
2480 MHz	1.329	**PASS**

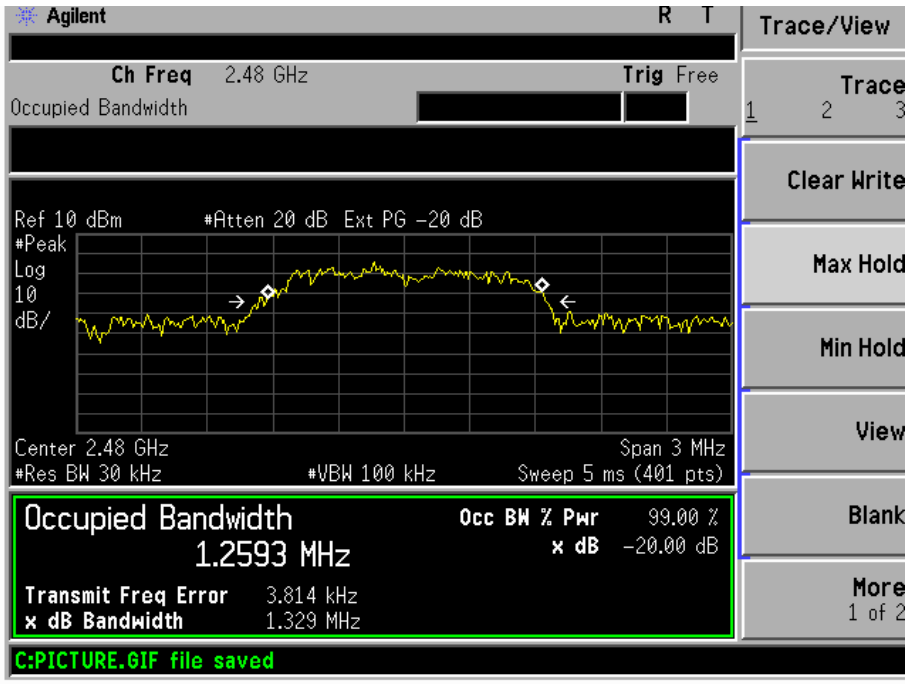
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



8. PEAK OUTPUT POWER TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(i)	Peak Output Power	30Bm or 20.96dBm	2400-2483.5	PASS

8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

VBW ≥ RBW

Sweep = auto

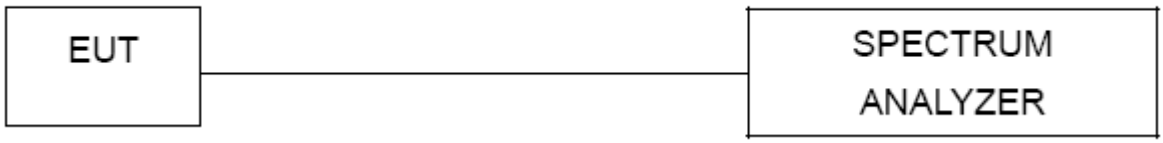
Detector function = peak

Trace = max hold

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

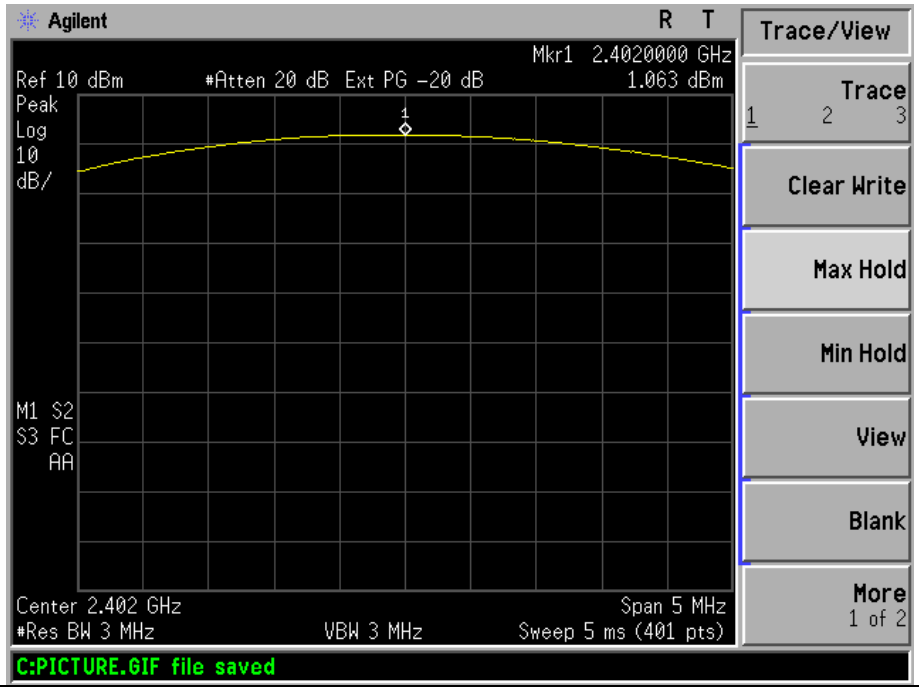
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 TEST RESULTS

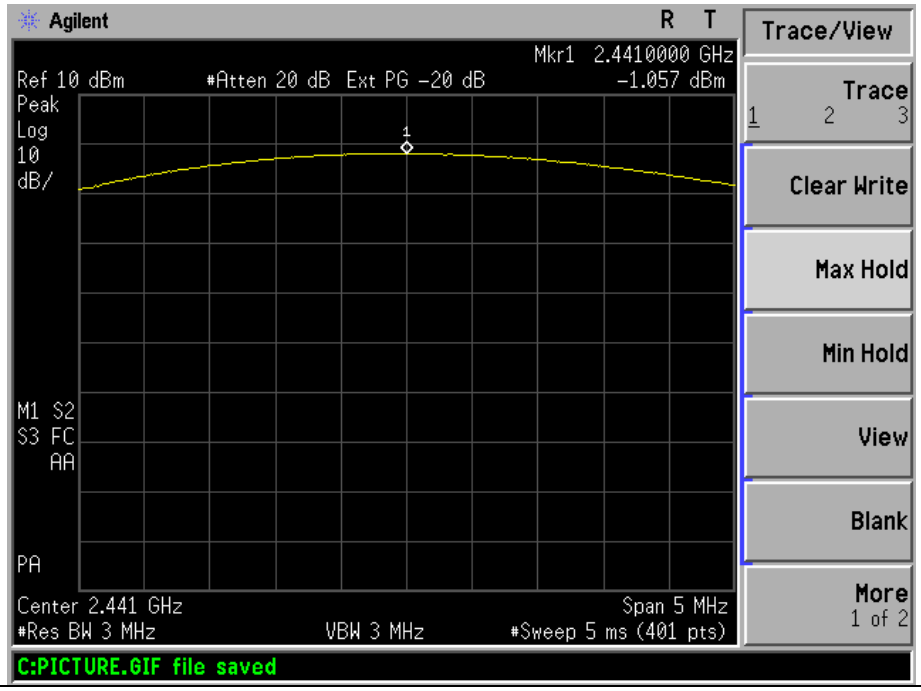
EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH39 /CH78 (1M/2M/3Mbps Mode)		

1Mbps			
Test Channel	Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)
CH00	2402	1.063	30.00
CH39	2441	-1.057	30.00
CH78	2480	-1.017	30.00
2Mbps			
CH00	2402	1.05	20.96
CH39	2441	-1.035	20.96
CH78	2480	-1.04	20.96
3Mbps			
CH00	2402	1.045	20.96
CH39	2441	-1.053	20.96
CH78	2480	-1.353	20.96

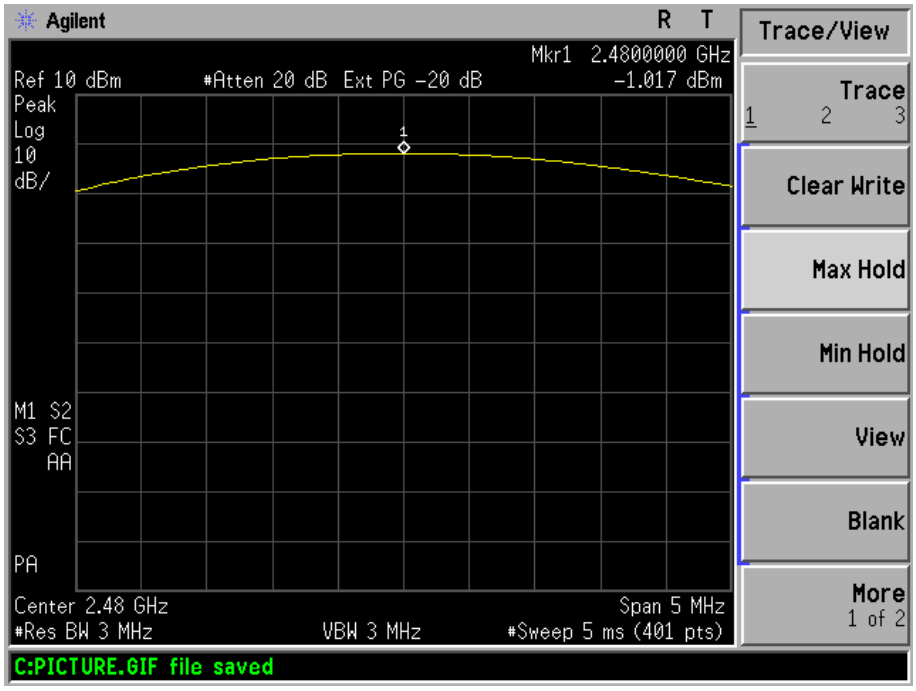
CH00 -1Mbps


Agilent
R T
Mkr1 2.4020000 GHz
Ref 10 dBm
#Atten 20 dB Ext PG -20 dB
1.063 dBm
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center 2.402 GHz
Span 5 MHz
#Res BW 3 MHz
VBW 3 MHz
Sweep 5 ms (401 pts)
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2
C:PICTURE.GIF file saved

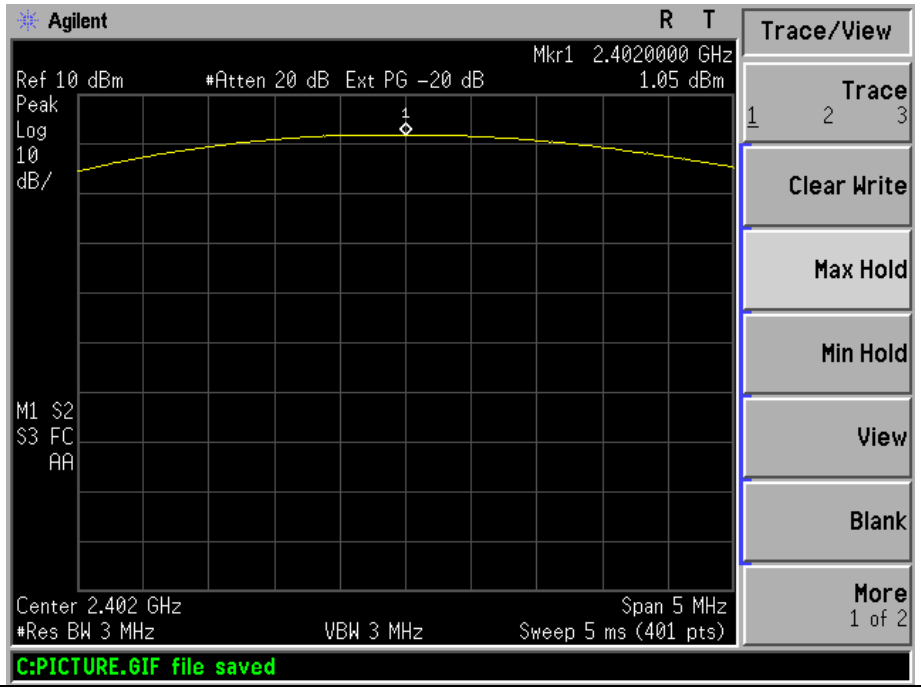
CH39 -1Mbps



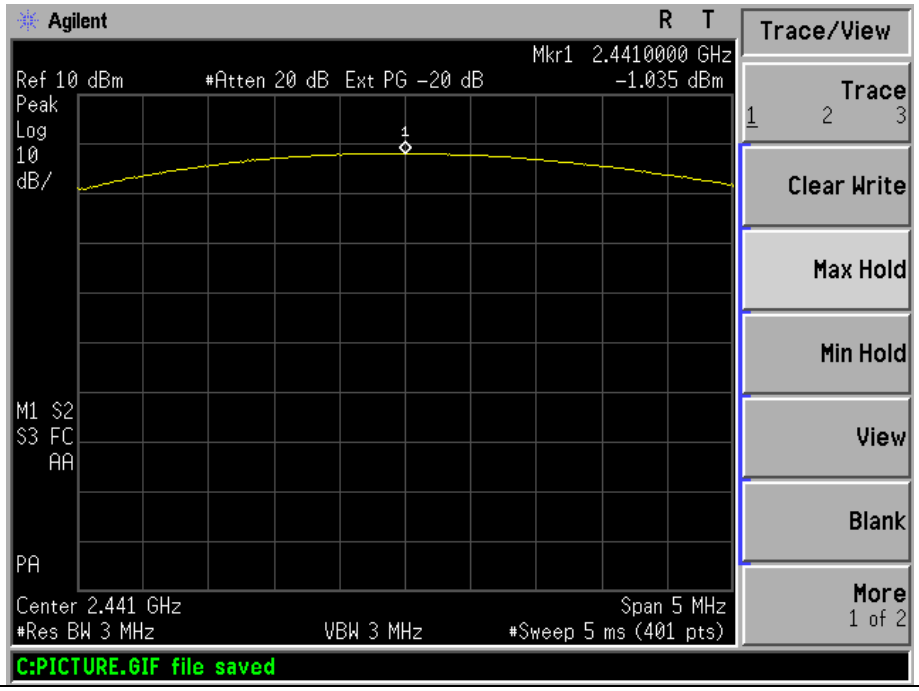
CH78 -1Mbps



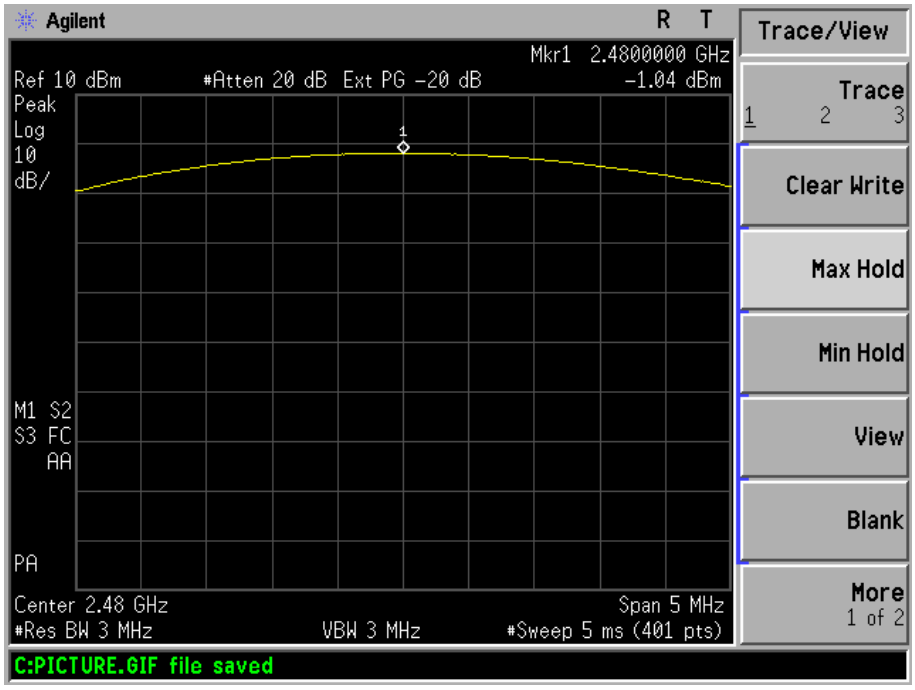
CH00 -2Mbps


Agilent
R T
Mkr1 2.4020000 GHz
Ref 10 dBm
#Atten 20 dB Ext PG -20 dB
1.05 dBm
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center 2.402 GHz
Span 5 MHz
#Res BW 3 MHz
VBW 3 MHz
Sweep 5 ms (401 pts)
C:PICTURE.GIF file saved
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

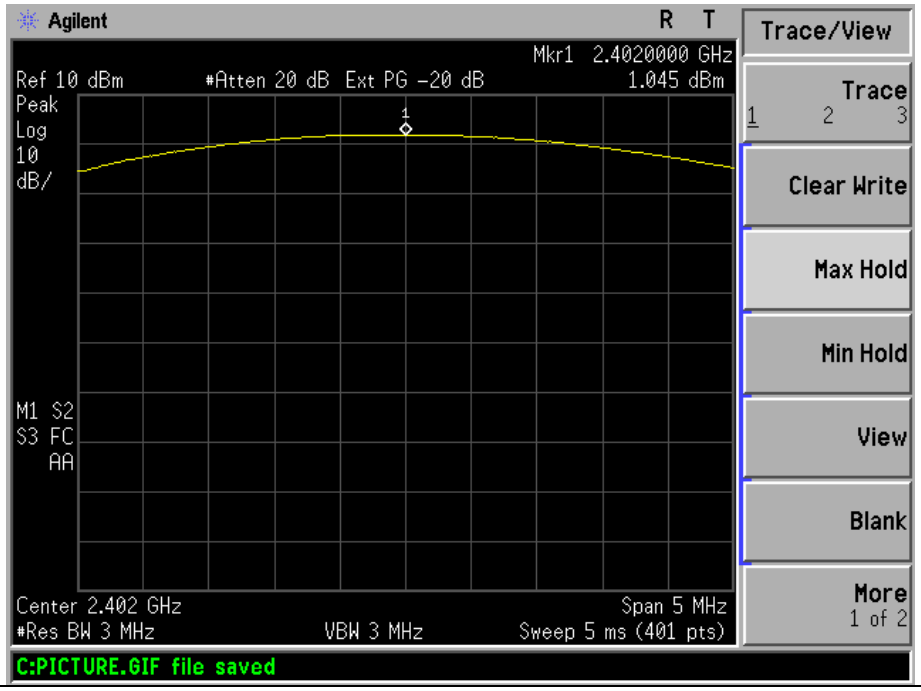
CH39 -2Mbps



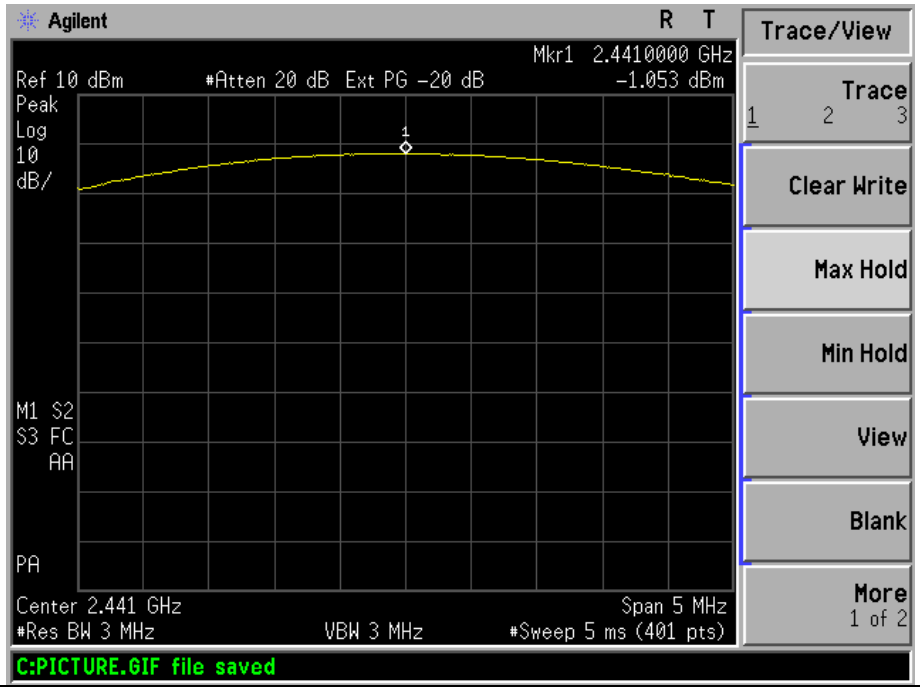
CH78 -2Mbps



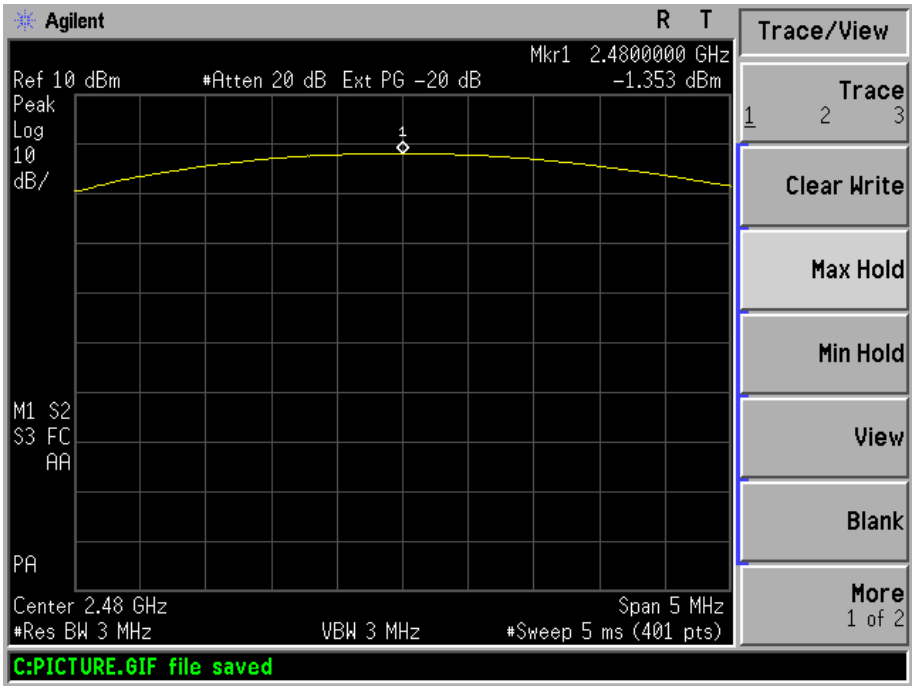
CH00 -3Mbps


Agilent
R T
Mkr1 2.4020000 GHz
Ref 10 dBm
#Atten 20 dB Ext PG -20 dB
1.045 dBm
Peak
Log
10
dB/
M1 S2
S3 FC
AA
Center 2.402 GHz
Span 5 MHz
#Res BW 3 MHz
VBW 3 MHz
Sweep 5 ms (401 pts)
C:PICTURE.GIF file saved
Trace/View
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2

CH39 -3Mbps



CH78 -3Mbps



9. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

APPLICABLE STANDARD

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

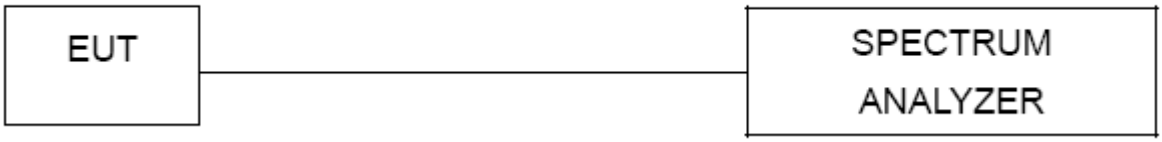
TEST PROCEDURE

a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
e) Repeat above procedures until all measured frequencies were complete.

9.1 DEVIATION FROM STANDARD

No deviation.

9.2 TEST SETUP



9.3 EUT OPERATION CONDITIONS

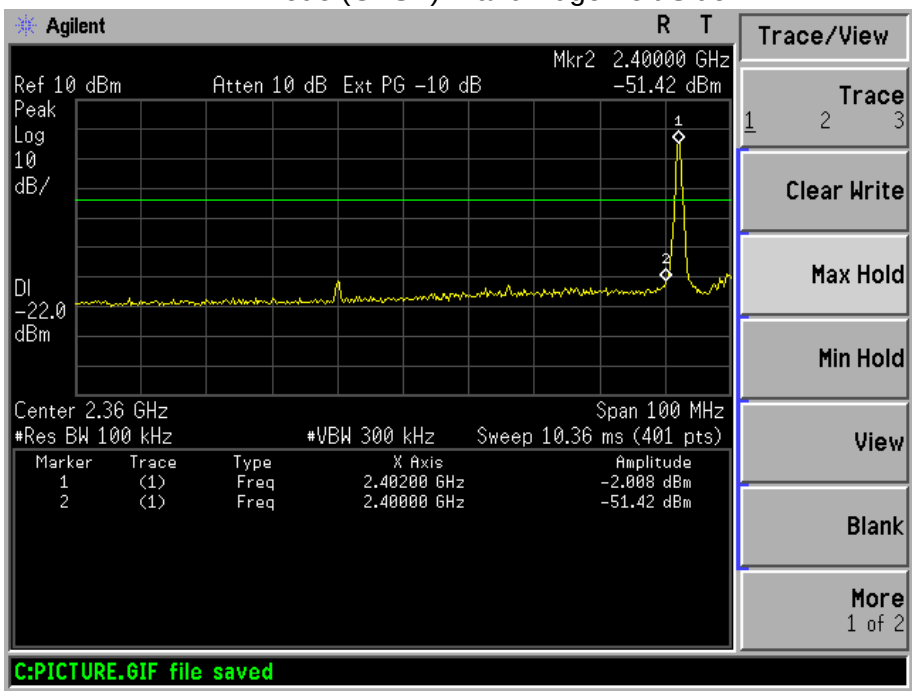
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

9.4 TEST RESULTS

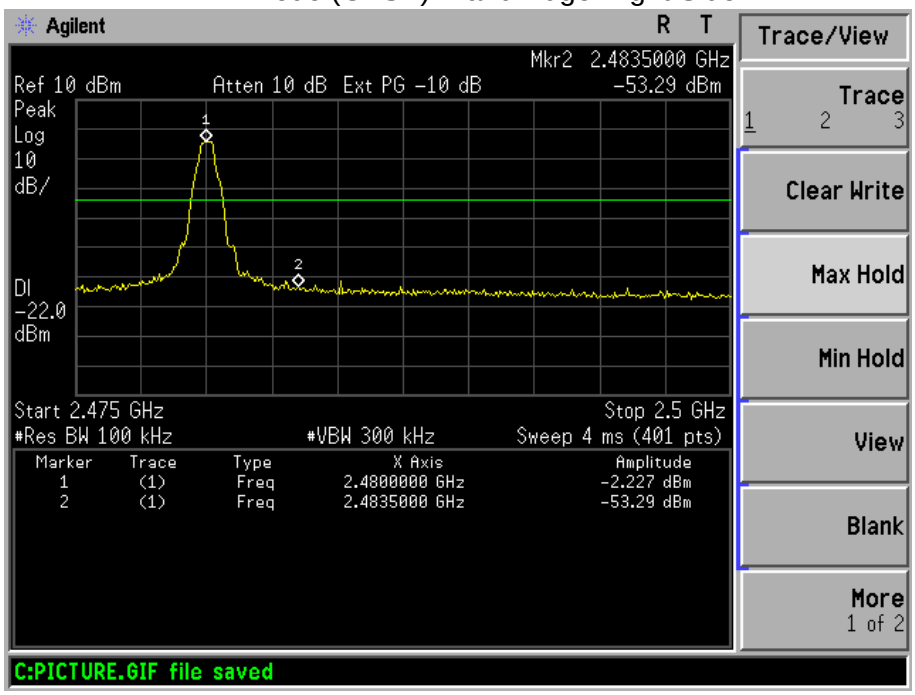
EUT：	Smart Bulb	Model Name ：	OMW168A
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	AC 120V/60Hz
Test Mode ：	CH00/ CH78 (1M/2M/3Mbps Mode)		

Frequency Band	Delta Peak to band emission (dBc)	＞Limit (dBc)	Result
BDR mode (GFSK)			
Left-band	49.41	20	Pass
Right-band	51.06	20	Pass
EDR mode (π/4-DQPSK)			
Left-band	46.80	20	Pass
Right-band	52.57	20	Pass
EDR mode(8DPSK)			
Left-band	48.77	20	Pass
Right-band	51.10	20	Pass

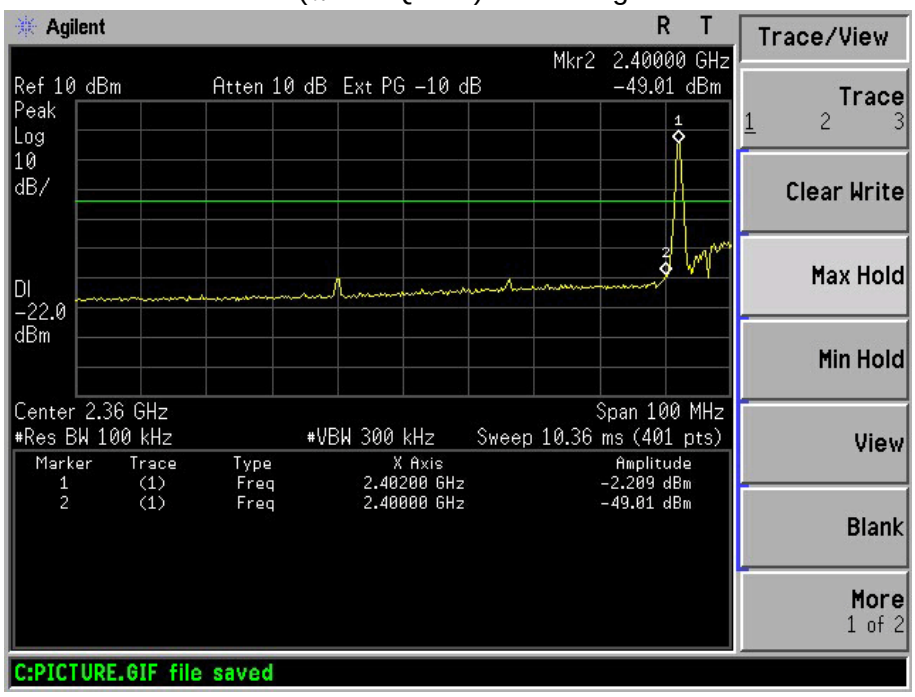
BDR mode (GFSK): Band Edge-Left Side



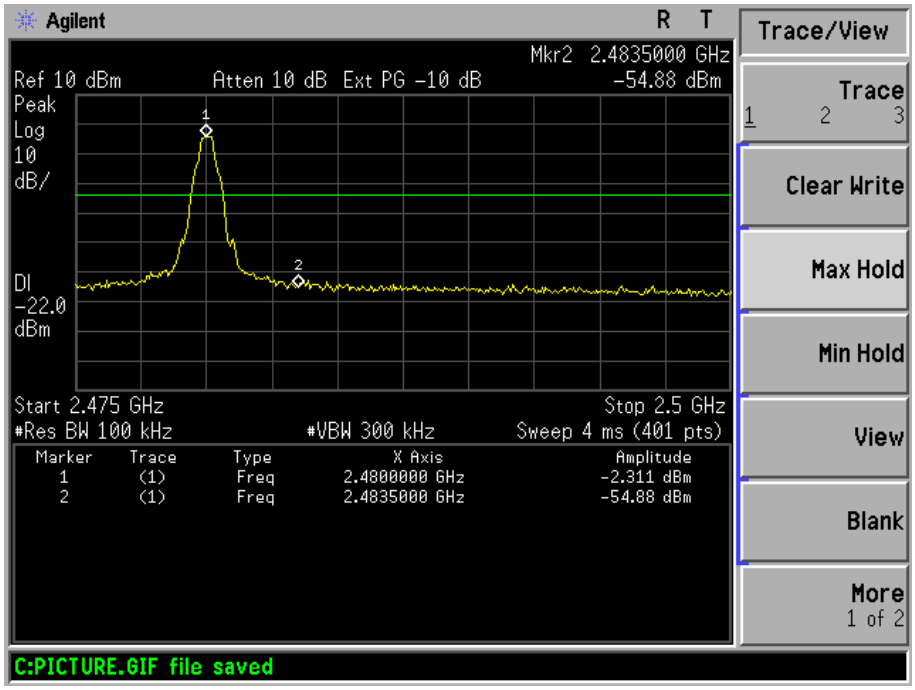
BDR mode (GFSK): Band Edge-Right Side



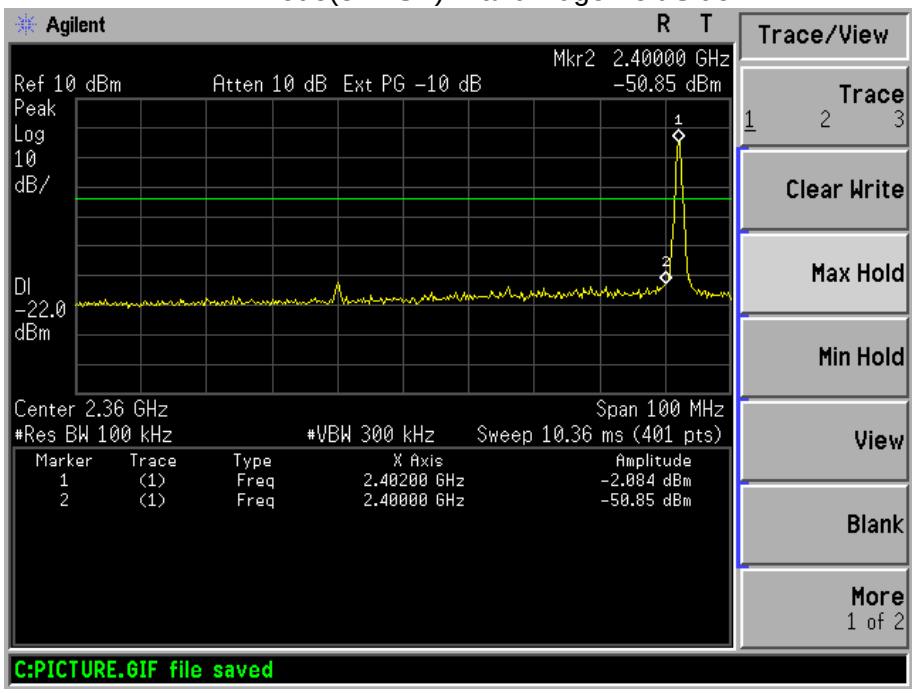
EDR mode (π/4-DQPSK): Band Edge-Left Side



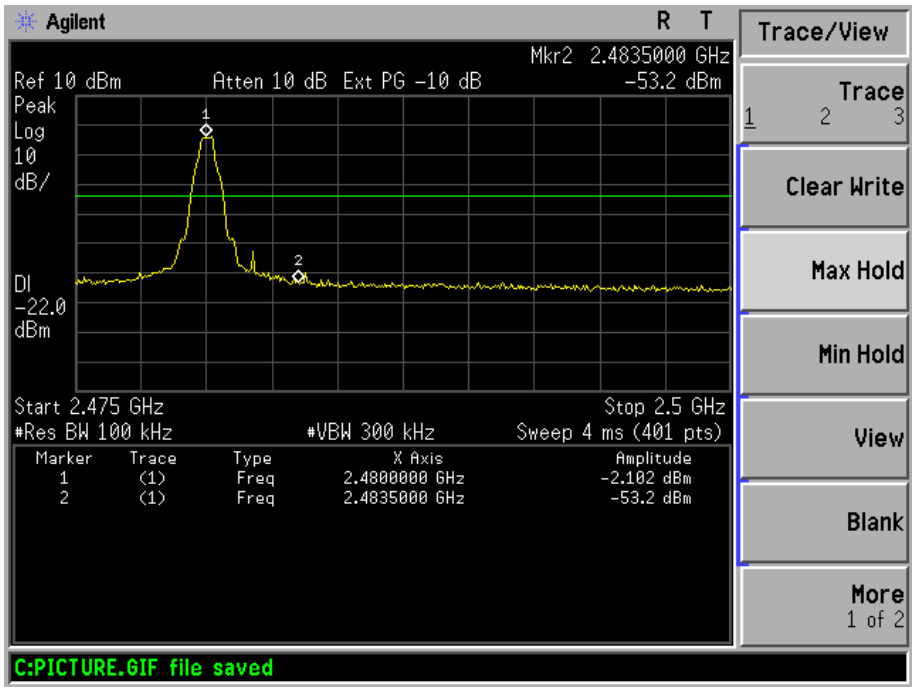
EDR mode (π/4-DQPSK): Band Edge-Right Side



EDR mode(8DPSK): Band Edge-Left Side



EDR mode(8DPSK): Band Edge-Right Side



NOTE: Hopping enabled and disabled have evaluated,and the wortest data was reported

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

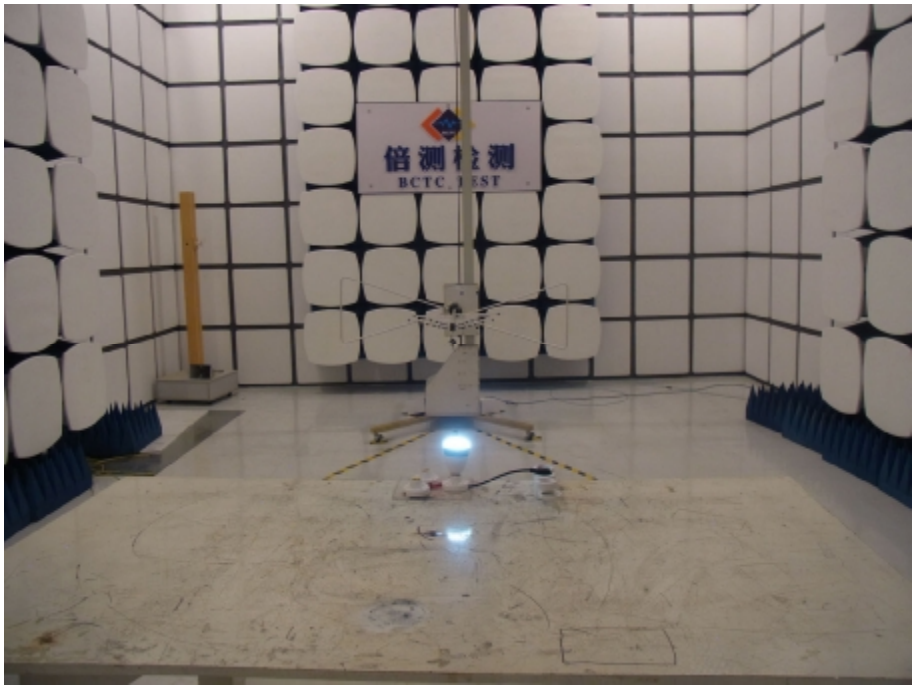
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

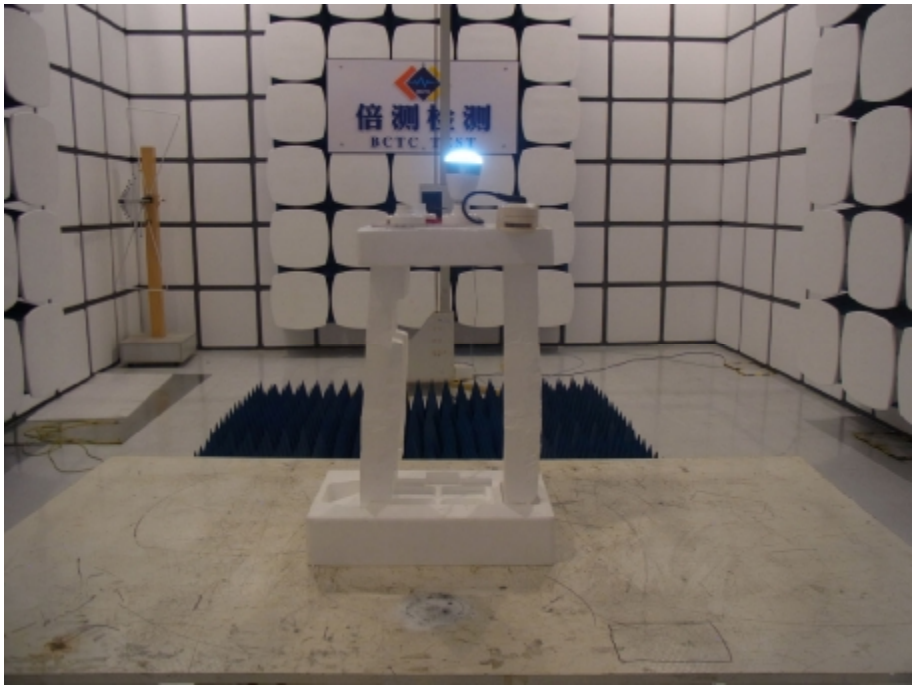
10.2 EUT ANTENNA

The EUT antenna is FPCB antenna. It comply with the standard requirement.

11. EUT TEST PHOTO

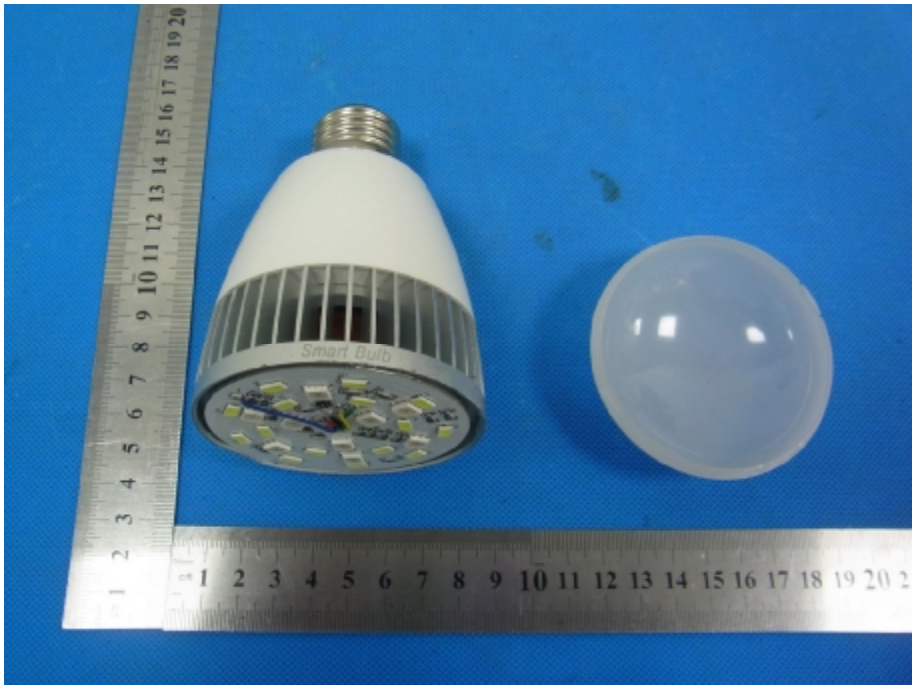
Radiated Measurement Photos





CONDUCTED EMISSION Photos

12. EUT PHOTO


Smart Bulb