



FCC TEST REPORT

FCC ID: 2A5K7-WRD36WRGBCCT

Product	:	Stage lights
Model Name	:	WRD36WRGBCCT,OK-094-APPWLx2,OK-095-24APPWL,OK-078-APPWL,YS-052-APPWLx2,OK-098-40WAPPFL,LA-051-40W FL,LA-055-40W FL,GL001,BCS-20w,RGBCW-20W,LS-6P-30W,FL-30W-RGBCW
Brand	:	N/A
Report No.	:	PTC22022106101E-FC01
Sample	:	PTC22022106101-#1
Prepared for		
Shenzhen Wenrunda Technology Co., Ltd.		
Room 402, No. 252, Daer Village, Dashuikeng Community, Fucheng Street, Longhua District, Shenzhen		
Prepared by		
Precise Testing & Certification Co., Ltd		
Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China		



1 TEST RESULT CERTIFICATION

Applicant's name : Shenzhen Wenrunda Technology Co., Ltd.
Address : Room 402, No. 252, Daer Village, Dashuikeng Community, Fucheng Street, Longhua District, Shenzhen
Manufacture's name : Shenzhen Wenrunda Technology Co., Ltd.
Address : Room 402, No. 252, Daer Village, Dashuikeng Community, Fucheng Street, Longhua District, Shenzhen
Product name : Stage lights
Model name : WRD36WRGBCCT,OK-094-APPWLx2,OK-095-24APPWL,OK-078-APPWL,YS-052-APPWLx2,OK-098-40WAPPFL,LA-051-40W FL,LA-055-40W FL,GL001,BCS-20w,RGBCW-20W,LS-6P-30W,FL-30W-RGBCW
Standards : FCC CFR47 Part 15 Section 15.247
Test procedure : ANSI C63.10:2013
Test Date : Feb.16, 2022 to Mar. 08, 2022
Date of Issue : Mar. 09, 2022
Test Result : Pass

This device described above has been tested by PTC, 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 Engineer:

Leo Yang / Engineer

Technical Manager:

Chris Du / Manager



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2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	PASS
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Conducted Spurious Emission	15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Power Spectral Density	15.247(e)	PASS
Antenna Requirement	15.203	PASS

Remark:

1. The EUT is powered by AC power during the test.



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2.1 Test Site

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1

CAB identifier: CN0080



3 General Information

3.1 General Description of E.U.T.

Product Name	:	Stage lights
Model Name	:	WRD36WRGBCCT,OK-094-APPWLx2,OK-095-24APPWL, OK-078-APPWL,YS-052-APPWLx2,OK-098-40WAPPFL, LA-051-40W FL,LA-055-40W FL,GL001,BCS-20w,RGBCW-20W, LS-6P-30W,FL-30W-RGBCW (Note: The samples are the same except appearance and model number. So WRD36WRGBCCT, was selected for full tested.)
Version	:	BLE 5.0
Operating frequency	:	2402-2480MHz
Number of Channels	:	40
Type of Modulation	:	GFSK
Antenna installation	:	Internal PCB Antenna
Antenna Gain	:	0dBi
Power supply	:	AC 120V 60Hz



3.2 Channel List

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been tested with software: **HCI_LE_Transmitter_Test** .

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The details of test channels and bandwidth were for RF conductive measurement.

Channel List:

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

Model	Frequency Range (MHz)	Tested Frequency (MHz)	Modulation	Data Rate(Mbps)
Bluetooth LE	2402-2480	2402, 2440, 2480	GFSK	1

Note:

1. Test of channel was included the lowest 2402MHz, middle 2440MHz and highest frequency 2480MHz in highest data rate and to perform the test, then record on this report.



4 Equipment During Test

4.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-26.5GHz	Sep.18, 2022	1 year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Sep.18, 2022	1 year
Antenna Connector	Florida RF Labs	N/A	RF01#	N/A	Sep.18, 2022	1 year
Power Meter	Anritsu	ML2495A	0949003	N/A	Sep.18, 2022	1 year
Power Sensor	Anritsu	MA2411B	0917017	N/A	Sep.18, 2022	1 year
Attenuator	Marvelous	MVE2213-10	RF30	N/A	Sep.18, 2022	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions(Test Frequency from 9KHz-25GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep.18, 2022	1 year
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Sep.18, 2022	1 year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Sep.18, 2022	1 year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep.18, 2022	1 year
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep.18, 2022	1 year
Spectrum	Agilent	E4407B	MY45109572	9KHz-40GHz	Sep.18, 2022	1 year



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Analyzer						
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Sep.18, 2022	1 year
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Sep.18, 2022	1 year
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep.18, 2022	1 year

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep.18, 2022	1 year
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9KHz-300MHz	Sep.18, 2022	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Sep.18, 2022	1 year



4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	$\pm 1.0\text{dB}$
Power Spectral Density, conducted	$\pm 2.2\text{dB}$
Radio Frequency	$\pm 1 \times 10^{-6}$
Bandwidth	$\pm 1.5 \times 10^{-6}$
Time	$\pm 2\%$
Duty Cycle	$\pm 2\%$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 3\%$
Conducted Emissions (150kHz~30MHz)	$\pm 3.64\text{dB}$
Radiated Emission(30MHz~1GHz)	$\pm 5.03\text{dB}$
Radiated Emission(1GHz~25GHz)	$\pm 4.74\text{dB}$
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	



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4.3 Description of Support Units

Equipment	Model No.	Series No.

5 Conducted Emission

Test Requirement	: FCC CFR 47 Part 15 Section 15.207
Test Method	: ANSI C63.10: 2013
Test Result	: PASS
Frequency Range	: 150kHz to 30MHz
Class/Severity	: Class B

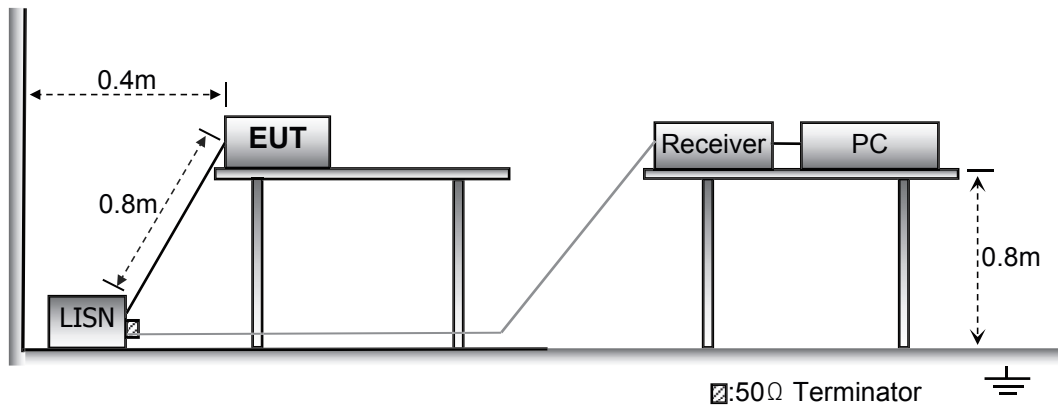
5.1 E.U.T. Operation

Operating Environment :

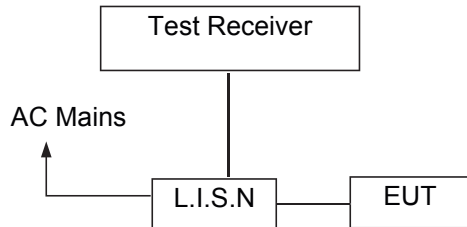
Temperature	: 25.5 °C
Humidity	: 51 % RH
Atmospheric Pressure	: 101.2kPa

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



5.3 Test SET-UP (Block Diagram of Configuration)



5.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

5.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

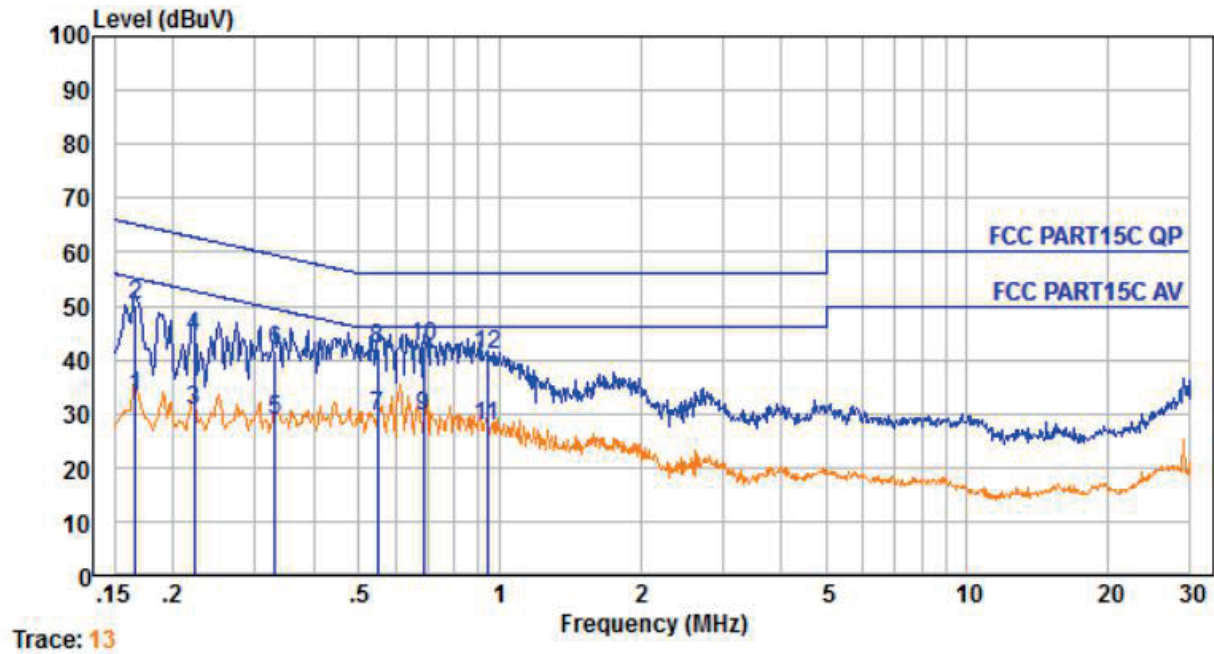
5.6 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.(All model is checked with the both power of AC 120V 60Hz ,worse case is AC 120V 60Hz, CH0 for recording)

5.7 Conducted Emission Test Result

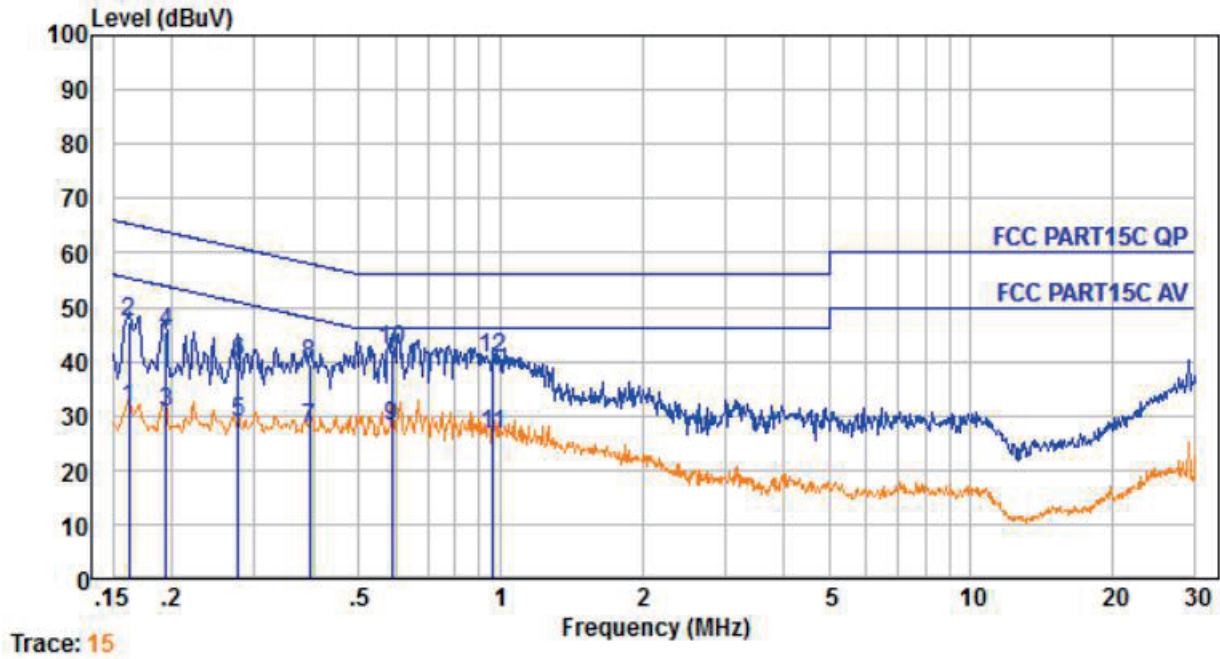
Pass.

Line:



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBμV	Emission Level dBμV	Limit dBμV	Over Limit dB	Remark
1.	0.166	0.23	9.59	23.42	33.24	55.16	-21.92	Average
2.	0.166	0.23	9.59	40.33	50.15	65.16	-15.01	QP
3.	0.222	0.30	9.59	20.87	30.76	52.74	-21.98	Average
4.	0.222	0.30	9.59	34.27	44.16	62.74	-18.58	QP
5.	0.330	0.38	9.60	18.95	28.93	49.44	-20.51	Average
6.	0.330	0.38	9.60	31.82	41.80	59.44	-17.64	QP
7.	0.549	0.43	9.61	19.56	29.60	46.00	-16.40	Average
8.	0.549	0.43	9.61	32.19	42.23	56.00	-13.77	QP
9.	0.686	0.44	9.61	19.62	29.67	46.00	-16.33	Average
10.	0.686	0.44	9.61	32.42	42.47	56.00	-13.53	QP
11.	0.943	0.46	9.61	17.50	27.57	46.00	-18.43	Average
12.	0.943	0.46	9.61	30.93	41.00	56.00	-15.00	QP

Neutral



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBμV	Emission Level dBμV	Limit dBμV	Over Limit dB	Remark
1.	0.162	0.23	9.60	21.40	31.23	55.34	-24.11	Average
2.	0.162	0.23	9.60	37.23	47.06	65.34	-18.28	QP
3.	0.194	0.27	9.61	20.74	30.62	53.84	-23.22	Average
4.	0.194	0.27	9.61	35.51	45.39	63.84	-18.45	QP
5.	0.277	0.35	9.62	18.99	28.96	50.90	-21.94	Average
6.	0.277	0.35	9.62	30.06	40.03	60.90	-20.87	QP
7.	0.393	0.40	9.62	17.83	27.85	47.99	-20.14	Average
8.	0.393	0.40	9.62	29.37	39.39	57.99	-18.60	QP
9.	0.589	0.43	9.63	18.10	28.16	46.00	-17.84	Average
10.	0.589	0.43	9.63	32.09	42.15	56.00	-13.85	QP
11.	0.963	0.46	9.64	16.46	26.56	46.00	-19.44	Average
12.	0.963	0.46	9.64	30.47	40.57	56.00	-15.43	QP



6 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247
 Test Method : ANSI C63.10:2013
 Test Result : PASS
 Measurement Distance : 3m
 Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

6.1 EUT Operation

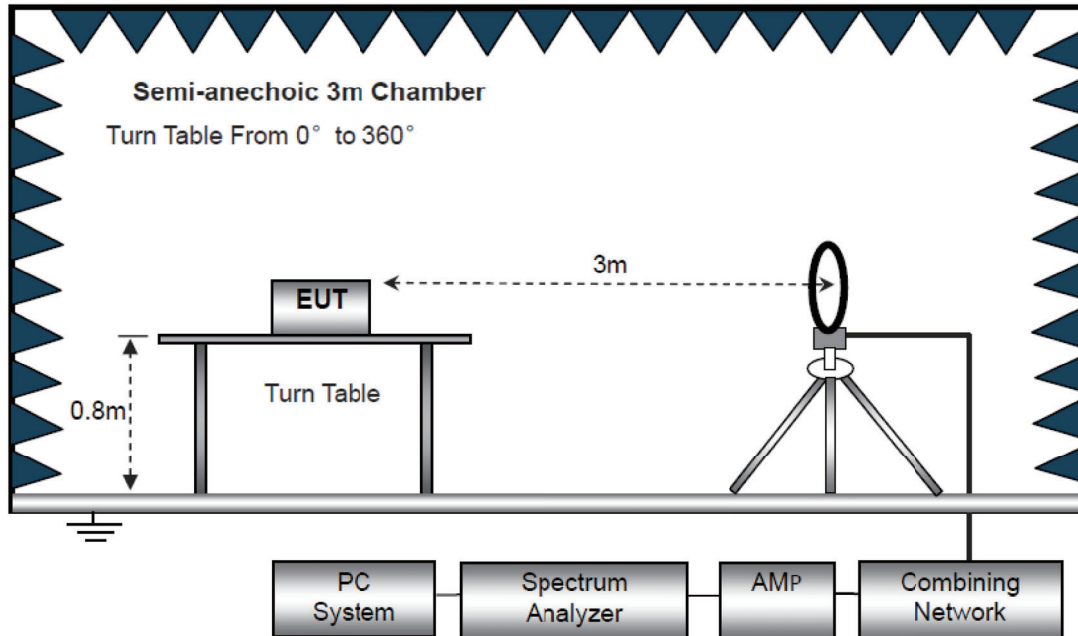
Operating Environment :

Temperature : 23.5 °C
 Humidity : 51.1 % RH
 Atmospheric Pressure : 101.2kPa

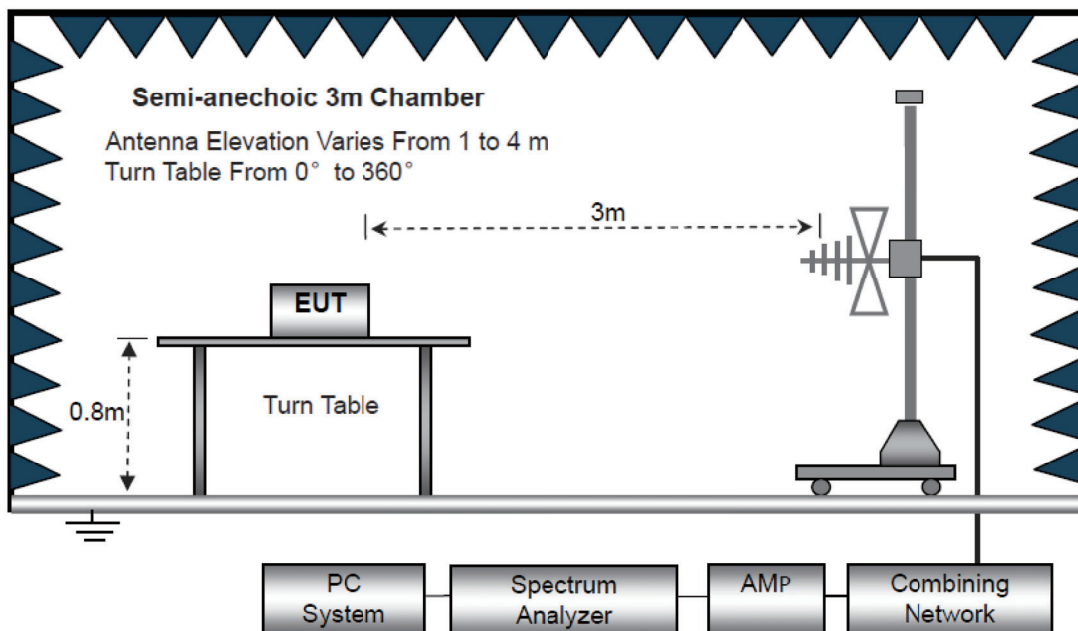
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

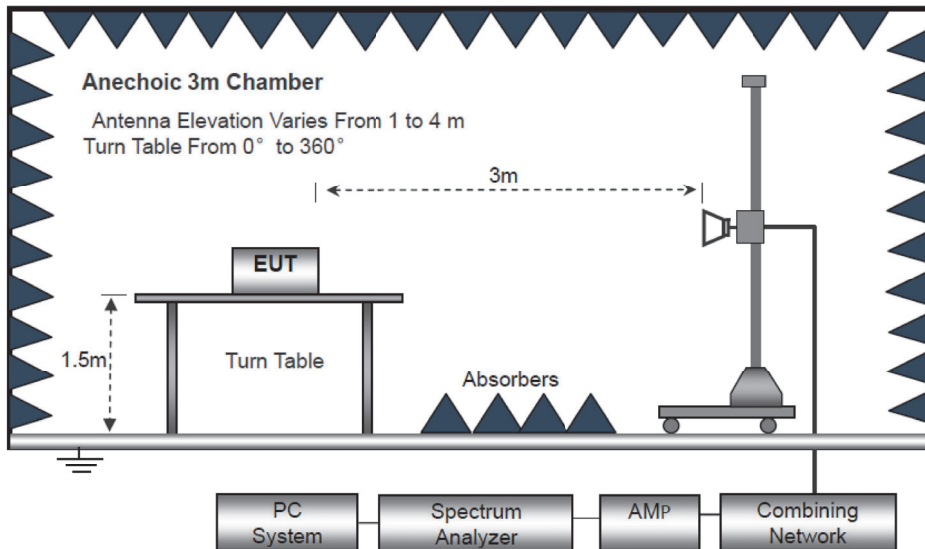
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



6.3 Spectrum Analyzer Setup

	Frequency	Detector	RBW	VBW	Remark
Receiver Setup	Below 30MHz	--	10kHz	10kHz	--
	30MHz ~ 1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value



6.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
 - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
 - 2) Change the antenna polarization and repeat 1) with vertical polarization.
 - 3) Make a hardcopy of the spectrum.
 - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
 - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
 - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
 - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
 - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
8. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.



For Average Measurement:

VBW=10Hz, when duty cycle is no less than 98 percent.

VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is 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.

Band	Duty Cycle(%)	T(μ s)	1/T(KHz)	Average Correction Factor	VBW Setting
2402-2480	100	-	-	0	10Hz



6.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance} / \text{test distance})$ (dB);

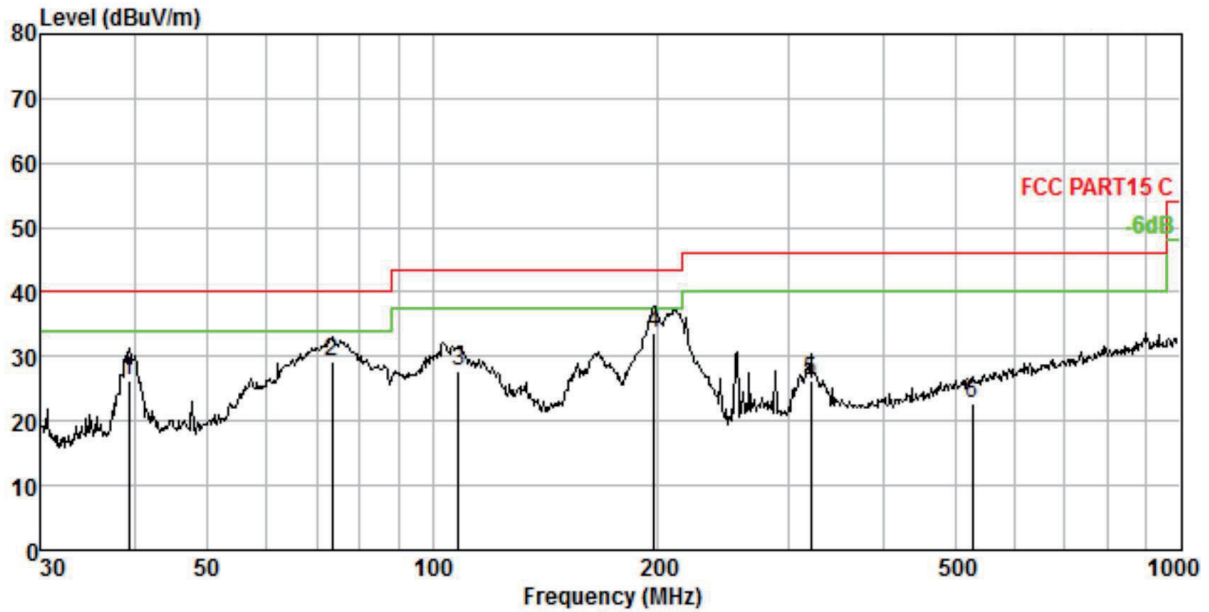
Limit line = Specific limits (dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Pass.

Please refer to the following test plots for the worst test mode (CH00: 2402MHz)).

Antenna Polarization: Horizontal GFSK(CH00: 2402MHz)



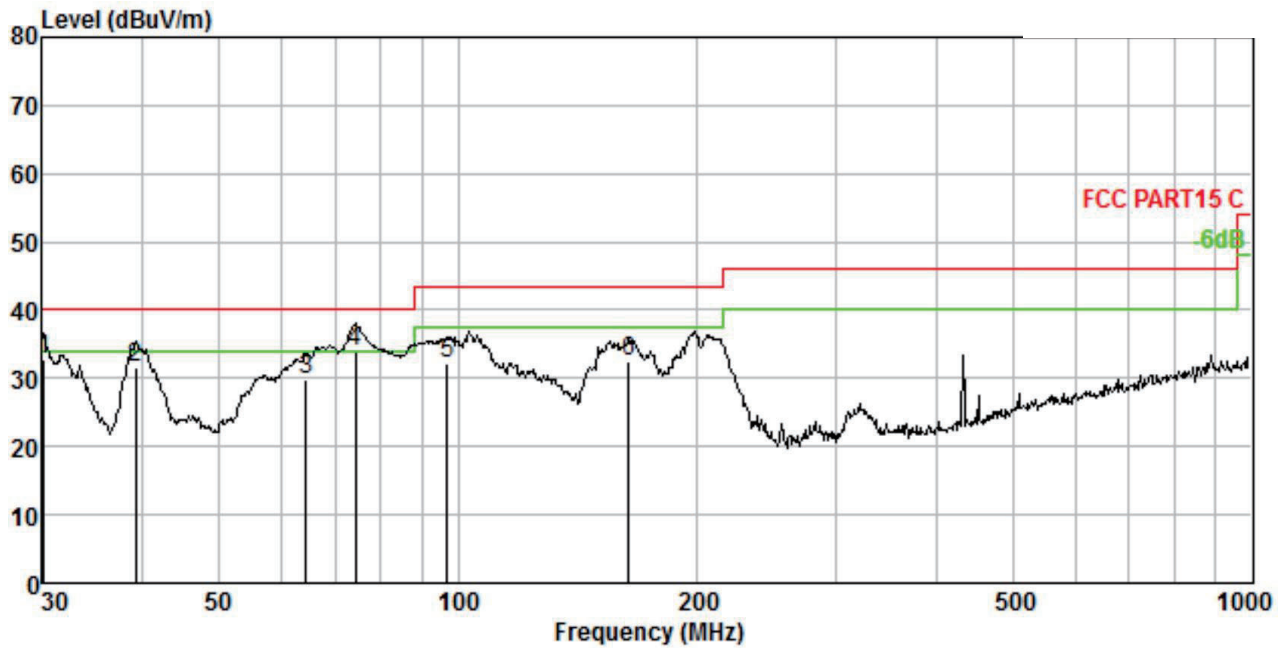
Env./Ins. : Temp.:24.5°C Humi.:52% Press.:101.3 kPa

No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	39.340	1.67	12.11	42.33	29.91	26.20	40.00	-13.80	QP
2.	73.402	2.74	9.62	46.76	29.96	29.16	40.00	-10.84	QP
3.	108.342	3.41	10.61	43.67	30.00	27.69	43.50	-15.81	QP
4.	197.614	4.44	11.17	48.15	30.04	33.72	43.50	-9.78	QP
5.	320.589	5.28	13.72	37.74	30.41	26.33	46.00	-19.67	QP
6.	526.021	6.13	17.85	29.77	30.93	22.82	46.00	-23.18	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor



Antenna Polarization: Vertical GFSK(CH00: 2402MHz)



Env./Ins. : Temp.:24.5°C Humi.:52% Press.:101.3 kPa

No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	30.080	1.20	11.71	49.70	29.89	32.72	40.00	-7.28	QP
2.	39.340	1.67	12.11	47.60	29.91	31.47	40.00	-8.53	QP
3.	64.306	2.51	11.09	46.07	29.95	29.72	40.00	-10.28	QP
4.	74.239	2.76	9.50	51.64	29.96	33.94	40.00	-6.06	QP
5.	97.094	3.22	9.31	49.58	29.99	32.12	43.50	-11.38	QP
6.	164.202	4.12	13.75	44.74	30.03	32.58	43.50	-10.92	QP

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor



Test Frequency 1GHz-25GHz:

Low Channel (2402MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4804	35.69	AV	V	30.58	4.92	35.87	35.32	54	-18.68
4804	36.15	AV	H	30.58	4.92	35.87	35.78	54	-18.22
4804	41.45	PK	V	30.58	4.92	35.87	41.08	74	-32.92
4804	46.22	PK	H	30.58	4.92	35.87	45.85	74	-28.15
7206	34.28	AV	V	30.76	4.98	35.04	34.98	54	-19.02
7206	35.02	AV	H	30.76	4.98	35.04	35.72	54	-18.28
7206	46.82	PK	V	30.76	4.98	35.04	47.52	74	-26.48
7206	48.12	PK	H	30.76	4.98	35.04	48.82	74	-25.18

Middle Channel (2440MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4880	36.21	AV	V	30.63	4.93	35.98	35.79	54	-18.21
4880	37.04	AV	H	30.63	4.93	35.98	36.62	54	-17.38
4880	42.15	PK	V	30.63	4.93	35.98	41.73	74	-32.27
4880	43.68	PK	H	30.63	4.93	35.98	43.26	74	-30.74
7320	35.22	AV	V	30.71	4.97	35.42	35.48	54	-18.52
7320	37.81	AV	H	30.71	4.97	35.42	38.07	54	-15.93
7320	44.29	PK	V	30.71	4.97	35.42	44.55	74	-29.45
7320	47.58	PK	H	30.71	4.97	35.42	47.84	74	-26.16

High Channel (2480MHz)

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4960	34.15	AV	V	31.22	5.10	36.51	33.96	54	-20.04
4960	35.29	AV	H	31.22	5.10	36.51	35.1	54	-18.9
4960	41.02	PK	V	31.22	5.10	36.51	40.83	74	-33.17
4960	42.16	PK	H	31.22	5.10	36.51	41.97	74	-32.03
7440	33.28	AV	V	31.53	5.22	35.16	34.87	54	-19.13
7440	34.35	AV	H	31.53	5.22	35.16	35.94	54	-18.06
7440	42.55	PK	V	31.53	5.22	35.16	44.14	74	-29.86
7440	43.69	PK	H	31.53	5.22	35.16	45.28	74	-28.72

Note: 1. The testing has been conformed to $10 \times 2480\text{MHz} = 24800\text{MHz}$.

2. All other emissions more than 30dB below the limit.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor
Margin=Emission Level-Limit



7 Band Edge Measurement

Test Requirement	: Section 15.247(d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method	: ANSI C63.10:2013
Test Limit	: Regulation 15.247 (d), 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)).

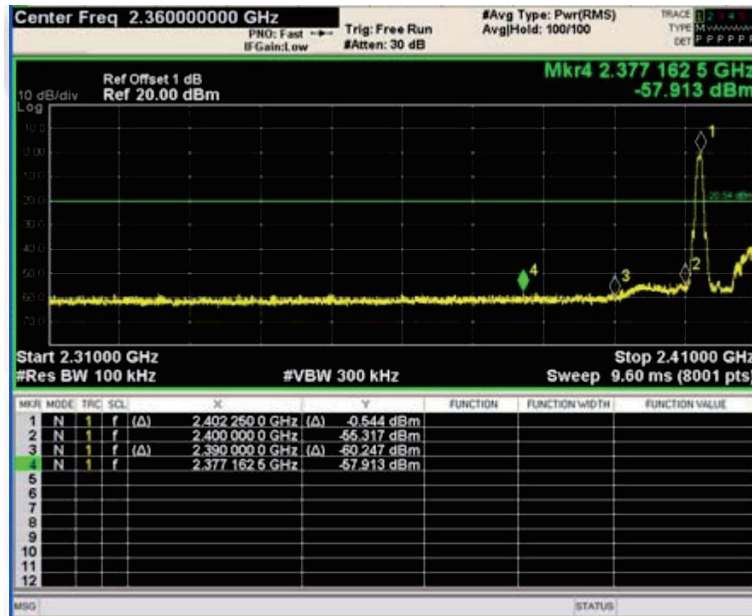
7.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold
3. Hopping on and hopping off mode all have been test, hopping off mode is worst and reported only.

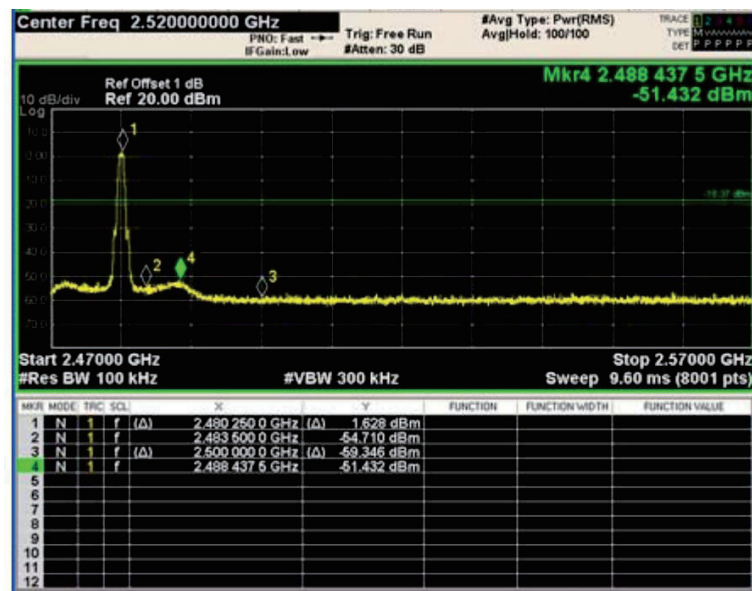


7.2 Test Result

CH0

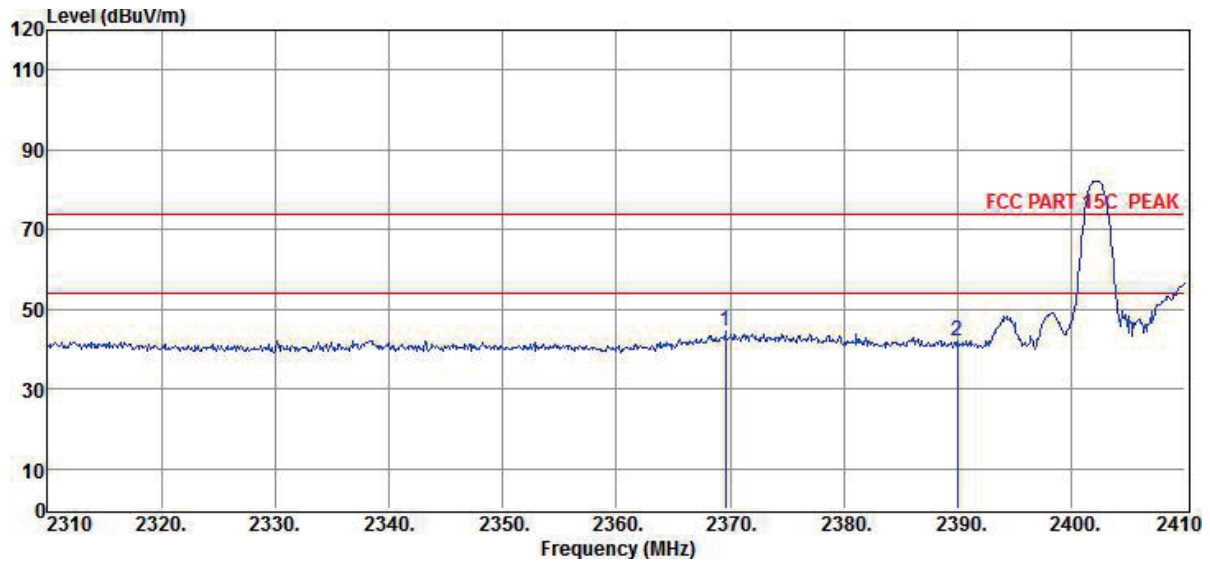


CH39





CH0

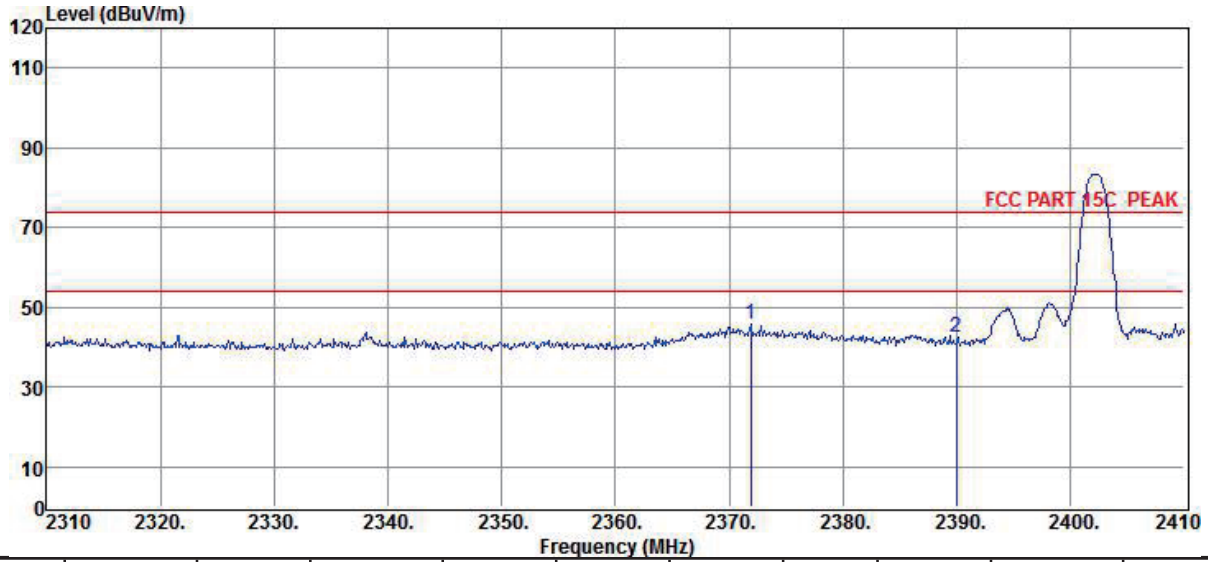


Item(Mark)	Freq.(MHz)	Read Level(dBμV)	Antenna Factor(dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit(dB)	Detector	Polarization
1	2369.59	56.76	26.93	44.32	5.09	44.46	74.00	-29.54	Peak	HORIZONTAL
2	2390.00	54.13	27.00	44.32	5.11	41.92	74.00	-32.08	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2371.90	57.96	26.94	44.32	5.09	45.67	74.00	-28.33	Peak	VERTICAL
2	2390.00	54.69	27.00	44.32	5.11	42.48	74.00	-31.52	Peak	VERTICAL

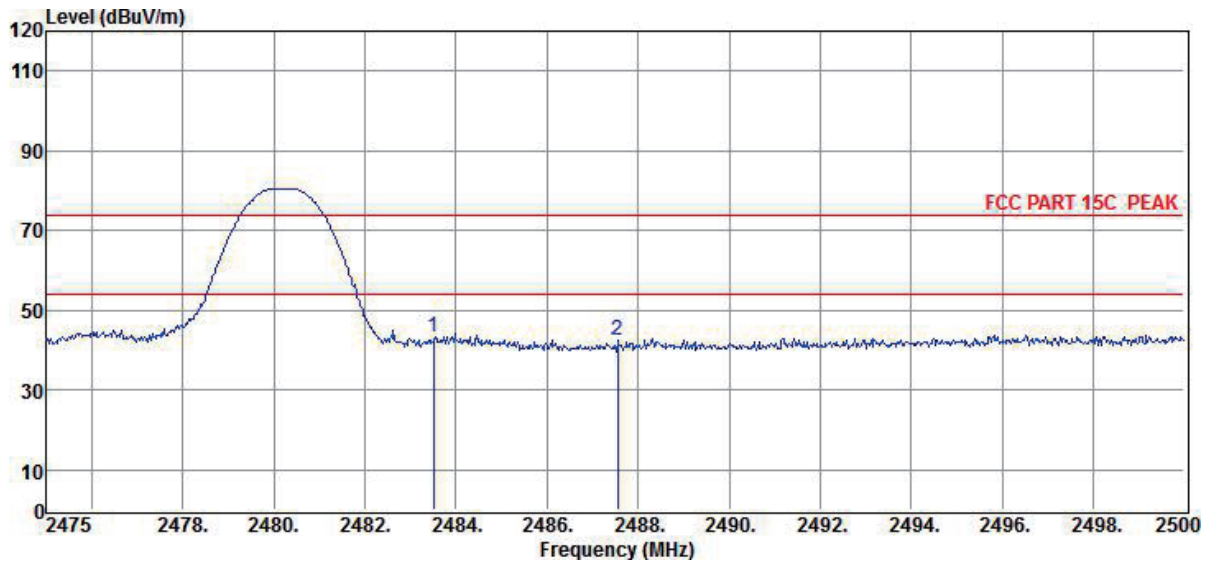
Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.



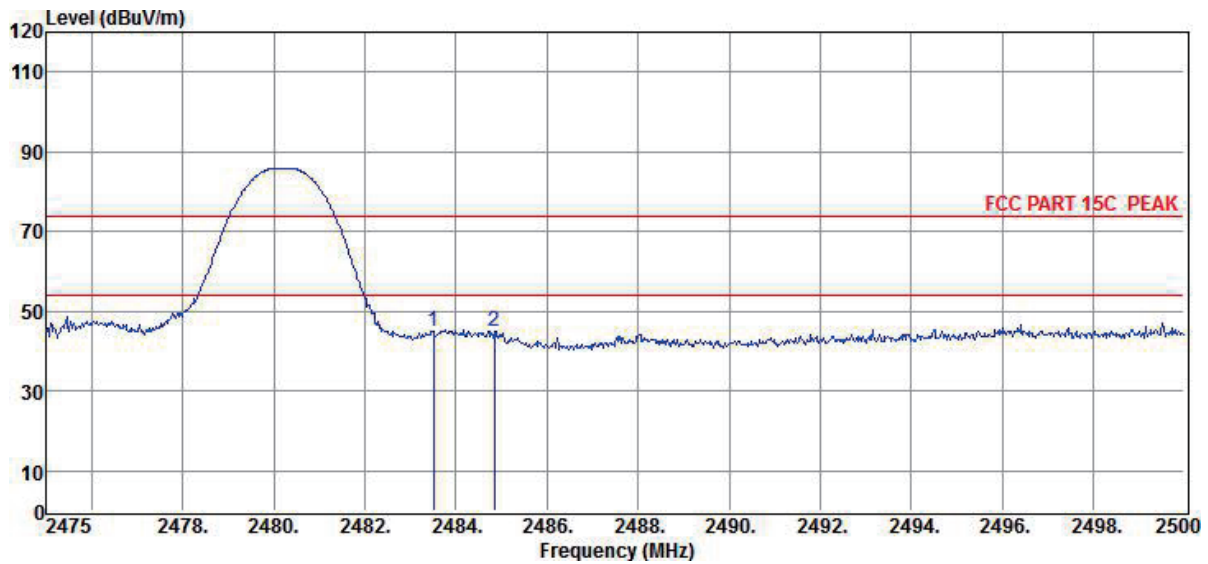
CH39



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/ m)	Over Limit (dB)	Detector	Polarization
1	2483.50	54.98	27.34	44.32	5.21	43.21	74.00	-30.79	Peak	HORIZONTAL
2	2487.55	54.38	27.36	44.32	5.22	42.64	74.00	-31.36	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/ m)	Over Limit (dB)	Detector	Polarization
1	2483.50	56.87	27.34	44.32	5.21	45.10	74.00	-28.90	Peak	VERTICAL
2	2484.85	56.78	27.35	44.32	5.21	45.02	74.00	-28.98	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.

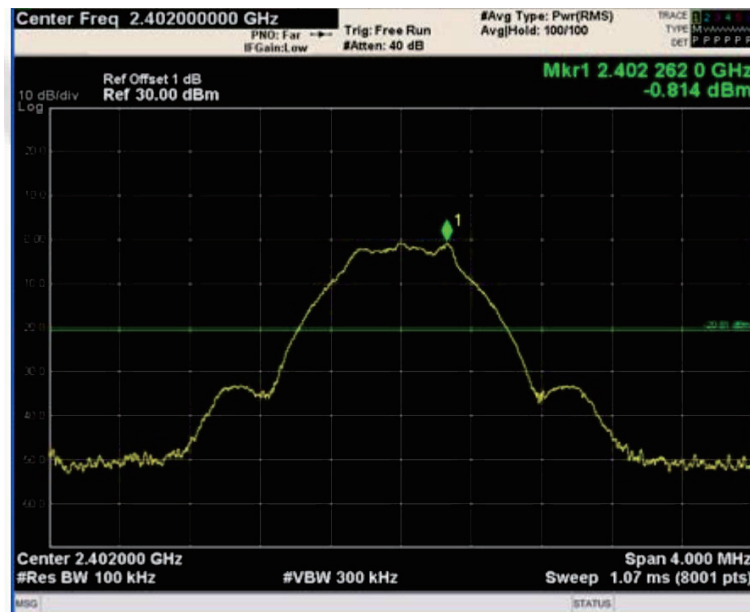
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.



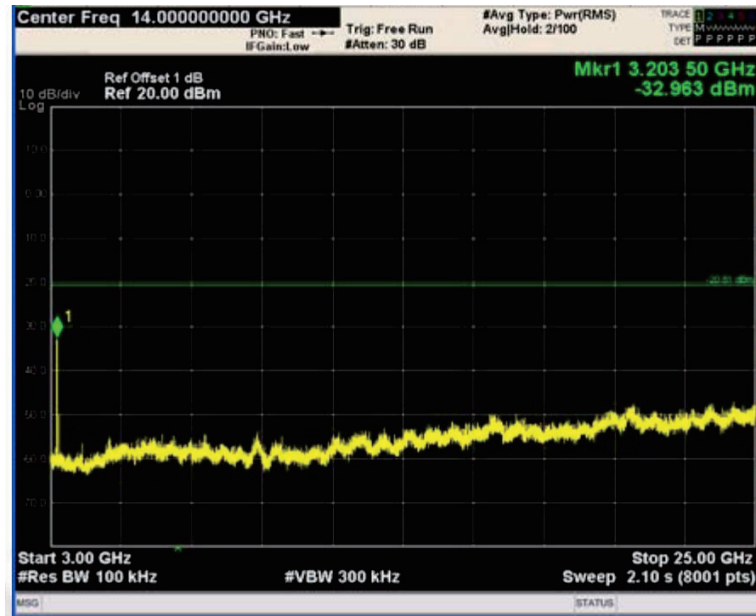
Conducted Spurious Emission Measurement Result

The worst mode is GFSK CH39 mode, and the report only show the worst mode data.





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8 6dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

Test Limit : Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.1 Test Procedure

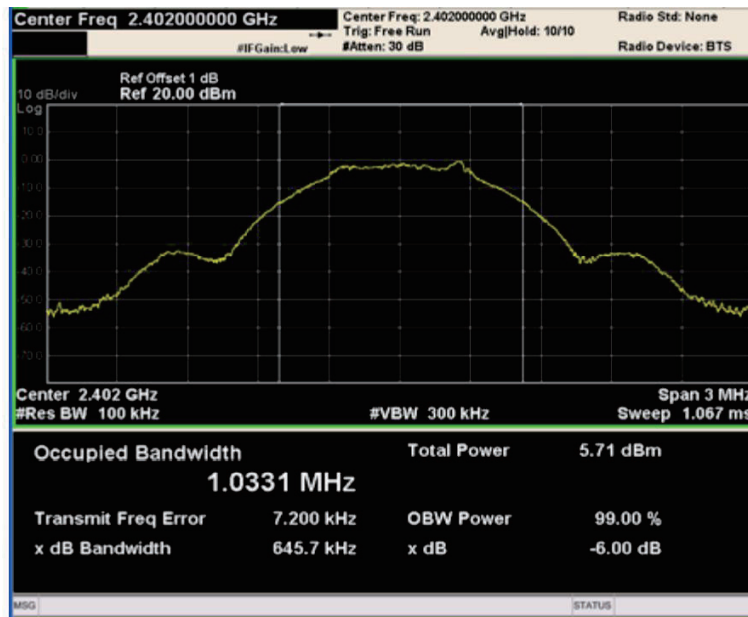
1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100KHz, Set the Video Bandwidth(VBW)= 300KHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500KHz.
4. Measure and record the results in the test report.

8.2 Test Result

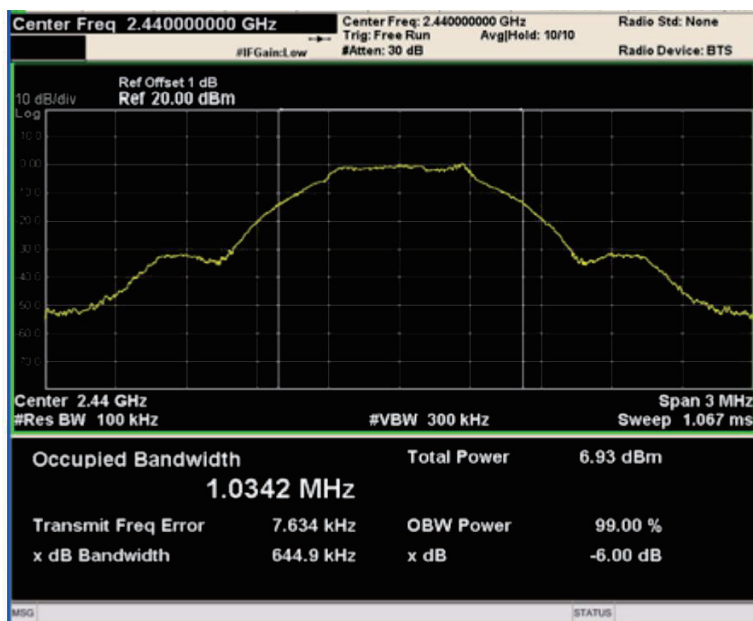
Channel frequency (MHz)	Measurement level (KHz)	Required Limit (KHz)	Result
2402	645.7	>500	Pass
2440	644.9	>500	Pass
2480	648.4	>500	Pass



TX CH 00



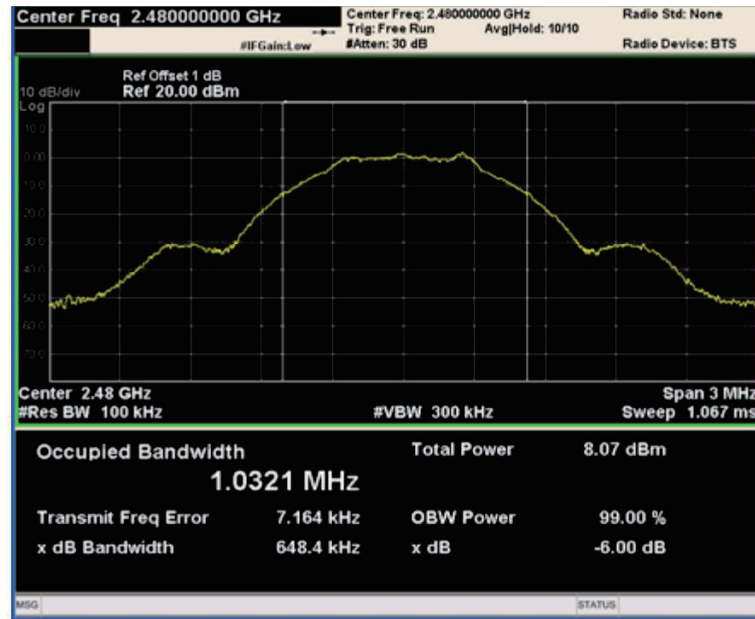
TX CH 19





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TX CH 39

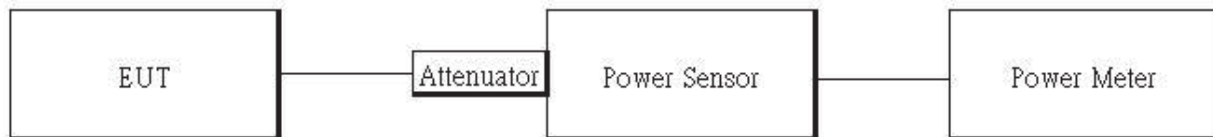




9 Maximum Peak Output Power

Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10:2013
Test Limit	: Regulation 15.247 (b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

9.1 Test Setup



9.2 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the power meter.
4. Record the max. Reading as observed from Power Meter.
5. Repeat above procedures until all test default channel measured was complete.

9.3 Test Result

BLE Mode:

Frequency (MHz)	Peak Power Output (dBm)	Limit(dBm)
2402	-0.116	30
2440	1.148	30
2480	2.122	30



10 Power Spectral density

Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10:2013
Test Limit	: Regulation 15.247(f) The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.1 Test Procedure

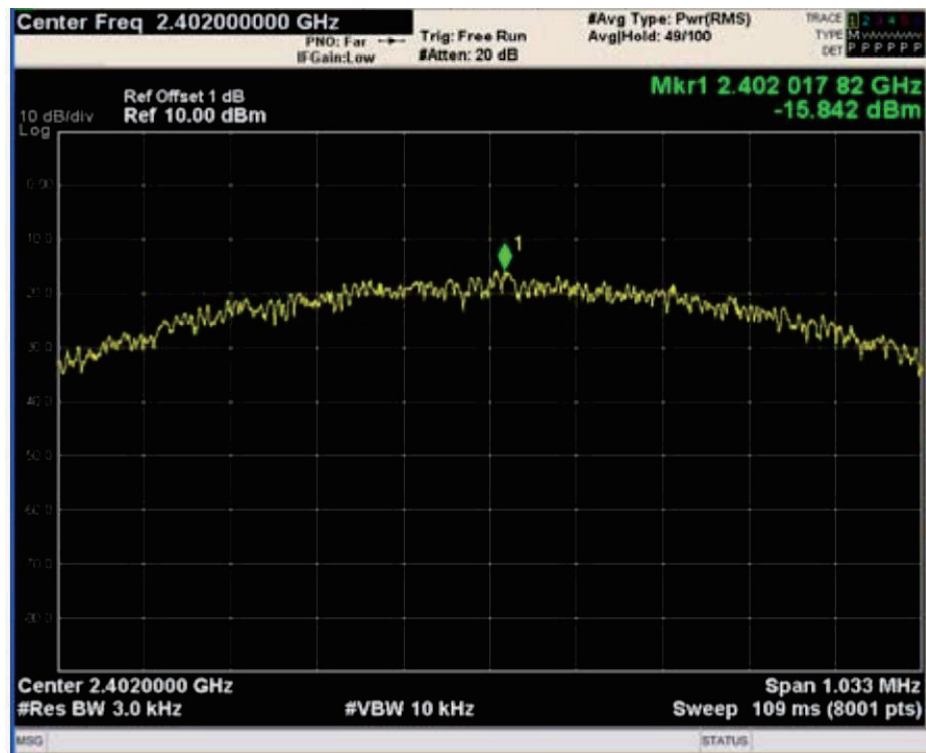
1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW0 = 3KHz, Video Bandwidth (VBW) = 10KHz, in order to make an accurate measurement, set the span to 1.5 times DTS channel bandwidth.
4. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
5. Measure and record the result in the test report.

10.2 Test Result

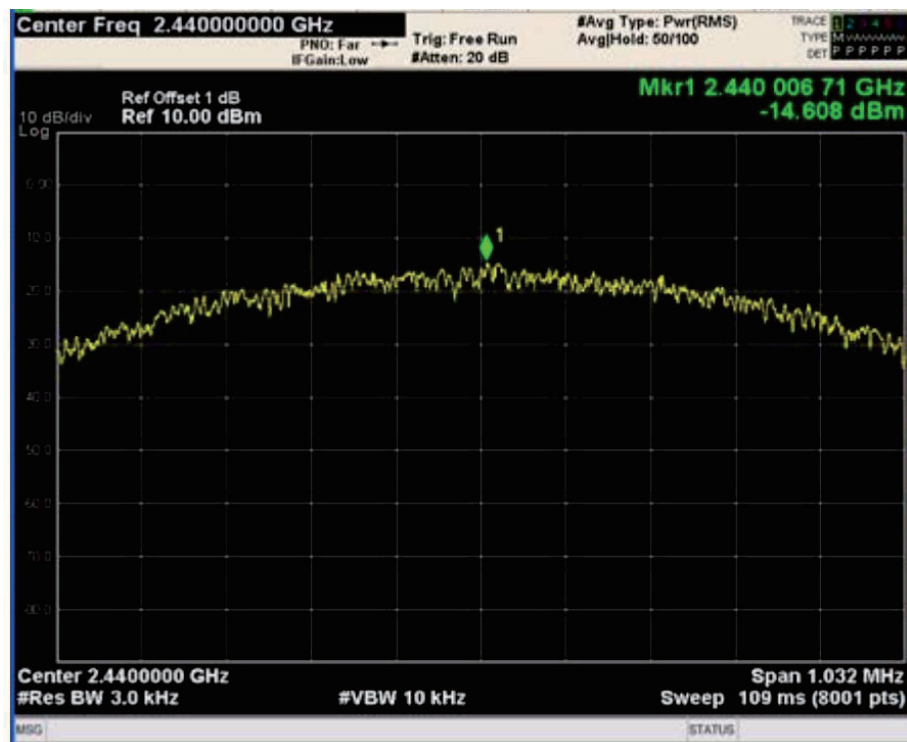
Channel frequency (MHz)	Measurement level (dBm)	Required Limit (dBm/3kHz)	Pass/Fail
	PSD/3kHz		
2402	-15.842	8	PASS
2440	-14.608	8	PASS
2480	-13.616	8	PASS



TX CH00

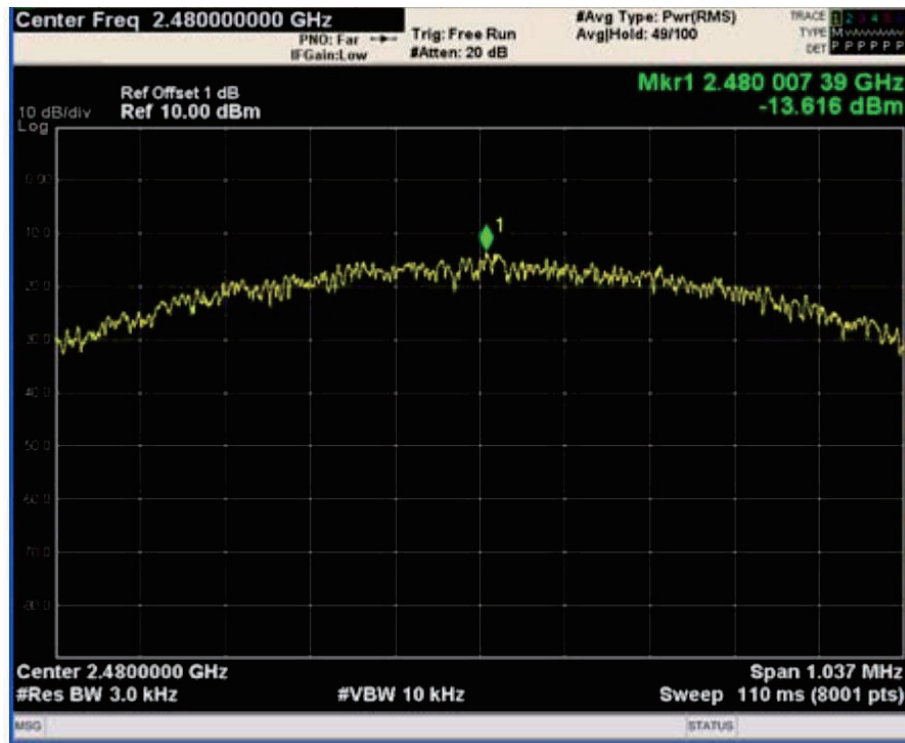


TX CH19





TX CH39





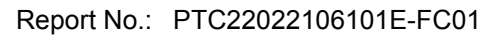
11 Antenna Application

11.1 Antenna Requirement

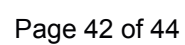
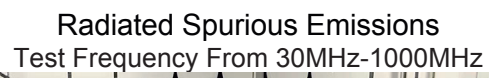
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2 Result

The EUT'S antenna, permanent attached antenna, is internal antenna. The antenna's gain is 0dBi and meets the requirement.



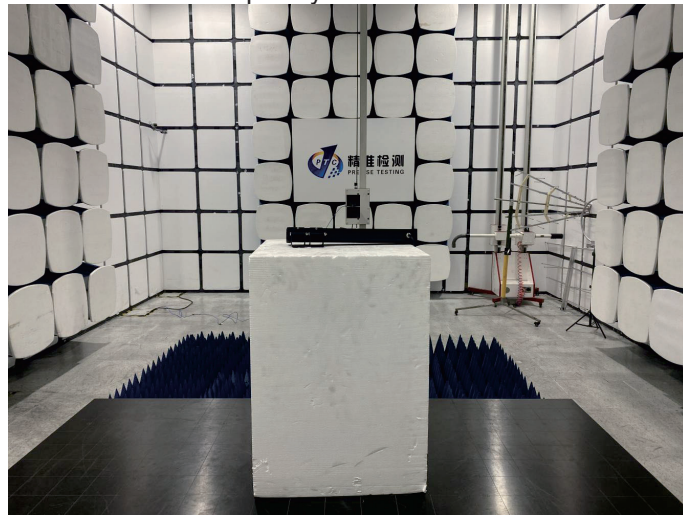
Conducted Emission





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Test frequency from 1GHz-25GHz





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13 EUT Photos

Please reference "EUT photos".

*******THE END REPORT*******