TEST REPORT

FCC ID: 2AF3EMX3-V

Applicant : **SHENZHEN QUALSENSE TECHNOLOGIES CO.,LTD**

Address : **Rm 105,Building D,BaoAn Smart Valley,No.4 YinTian Rd, XiXiang Town,BaoAn District,ShenZhen. China 518102**

Equipment Under Test (EUT):

Name	:	2.4G remote controller
Model	:	MX3-V

In Accordance with: FCC PART 15, SUBPART C : 2014 (Section 15.249)

Report No	:	T1851268 05
Date of Test	:	September 02 to September 22, 2015
Date of Issue	:	September 24, 2015
Test Result	:	PASS

In the configuration tested, the EUT complied with the standards specified above

Authorized Signature

(Mark Zhu)
General Manager

TABLE OF CONTENT

1 General Information ---- 3
1.1 Description of Device (EUT) ---- 3
1.2 Description of Test Facility ---- 4
2 EMC Equipment List ---- 4
3 Test Procedure ---- 5
4 Summary of Measurement ---- 6
4.1 Summary of test result ---- 6
4.2 Test connection ---- 6
4.3 Assistant equipment used for test ---- 6
4.4 Test mode ---- 7
4.5 Test Conditions ---- 8
4.6 Measurement Uncertainty (95% confidence levels, k=2) ---- 8
2 Radiation Emission ---- 9
2.1 Radiation Emission Limits(15.209&249) ---- 9
2.2 Test Setup ---- 10
2.3 Test Procedure ---- 11
2.4 Test Equipment Setting For emission test. ---- 12
2.5 Test Condition ---- 12
2.6 Test Result ---- 12
3 POWER LINE CONDUCTED EMISSION ---- 18
3.1 Conducted Emission Limits(15.207) ---- 18
3.2 Test Setup ---- 18
3.3 Test Procedure ---- 18
3.4 Test Results ---- 19
4 Occupied bandwidth ---- 20
4.1 Test limit ---- 20
4.2 Method of measurement ---- 20
4.3 Test Setup ---- 20
4.4 Test Results ---- 20
5 Band Edge Check ---- 23
5.1 Test limit ---- 23
5.2 Test Procedure ---- 23
5.3 Test Setup ---- 23
5.4 Test Result ---- 23
6 Antenna Requirement ---- 26
6.1 Standard Requirement ---- 26
6.2 Antenna Connected Construction ---- 26
6.3 Result ---- 26
7 Photographs of Test Setup ---- 27
8 Photographs of EUT ---- 28

1 General Information

1.1 Description of Device (EUT)

EUT	:	2.4G remote controller
Model No.	:	MX3-V
DIFF		N/A
Trade mark	:	N/A
Power supply	:	DC3.0V from 2*1.5V AAA battery
Radio Technology	:	2.4G ISM Band Radio
Operation frequency	:	2404-2480MHz
Channel No.		65Channels
Modulation	:	GFSK
Data rate	:	250kbps
Hardware	:	V1.7
Software	:	V1.0
Antenna Type	:	Integrated antenna with max gain -3dBi.
Applicant	:	SHENZHEN QUALSENSE TECHNOLOGIES CO.,LTD
Address	:	Rm 105,Building D,BaoAn Smart Valley,No.4 YinTian Rd, XiXiang Town,BaoAn District,ShenZhen. China 518102
Manufacturer	:	SHENZHEN QUALSENSE TECHNOLOGIES CO.,LTD
Address	:	Rm 105,Building D,BaoAn Smart Valley,No.4 YinTian Rd, XiXiang Town,BaoAn District,ShenZhen. China 518102

1.2 Description of Test Facility

Shenzhen Alpha Product Testing Co., Ltd.
Building B, East Area of Nanchang Second, Industrial Zone, Gushu 2nd Road,
Bao'an, Shenzhen, China

August 11, 2014 File on Federal Communication Commission
Registration Number: 203110

July 18, 2014 Certificated by IC
Registration Number: 12135A

2 EMC Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
3m Semi-Anechoic	ETS-LINDGREN	N/A	SEL0017	2015.01.19	1Year
Spectrum analyzer	Agilent	E4407B	MY49510055	2015.01.19	1Year
Receiver	R&S	ESCI	101165	2015.01.19	1Year
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2015.01.21	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2015.01.21	2Year
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170 D(1432)	2015.01.21	2Year
Active Loop Antenna	Beijing Daze	ZN30900A	SEL0097	2015.01.19	1Year
Cable(9KHz-30MHz)	Resenberger	SUCOFLEX 104	MY6562/4	2015.01.19	1Year
Cable(30MHz-1000MHz)	Resenberger	SUCOFLEX 104	309972/4	2015.01.19	1Year
Cable(1GHz-25GHz)	Resenberger	SUCOFLEX 104	329112/4	2015.01.19	1Year
Pre-amplifier	SCHWARZBECK	BBV9743	9743-019	2015.01.19	1Year
Pre-amplifier	Quietek	AP-180C	CHM-0602012	2015.01.19	1Year
Temporary antenna connector	Huber & Suhner	G042D	742-4012	2015.01.19	1Year

Note: 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.

3 Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The test procedure used was ANSI Standard C63.4-2009 using a 50 u H LISN. Both Lines were observed. The bandwidth of the receiver was 10kHz with an appropriate sweep speed. The ambient temperature of the EUT was 25℃ with a humidity of 58%.

RADIATION INTERFERENCE: The test procedure used was ANSI Standard C63.4-2009 using a ANRITSU spectrum analyzer with a pre-selector. The analyzer was calibrated in dB above a micro volt at the output of the antenna. The resolution bandwidth was 100kHz and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a video BW of 3MHz above 1 GHz. The ambient temperature of the EUT was 25℃ with a humidity of 58%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer and cable loss. The antenna correction factors and cable loss are stated in terms of dB. The gain of the Pre-selector was accounted for in the Spectrum Analyzer Meter Reading.
Example:
Freq (MHz) METER READING + ACF + CABLE = FS
33.20 dBuV + 10.36 dB + 0.9 dB= 44.46 dBuV/m @ 3m
ANSI STANDARD C63.4-2009 10.1.7 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation. When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes. The situation was similar for the conducted measurement except that the table did not rotate. The EUT was setup as described in ANSI Standard C63.4-2009 10.1.7 with the EUT 40 cm from the vertical ground wall.

4 Summary of Measurement

4.1 Summary of test result

Test Item	Test Requirement	Stanadard Paragraph	Result
Spurious Emission	FCC PART 15: 2014	Section 15.249&15.209	Compliance
Conduction Emission	FCC PART 15: 2014	Section 15.207	N/A
Occupied bandwidth	FCC PART 15: 2014	Section 15.249	Compliance
Band edge Requirement	FCC PART 15: 2014	Section 15.249	Compliance
Antenna Requirement	FCC PART 15: 2014	Section 15.203	Compliance

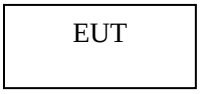
Note: The EUT has been tested at Continual Transmitting mode in maximum power level (New battery is used during the test)

EUT is configured to transmit continuously (Duty cycle) is 100%， average correction factor = 20 log 1=0

4.2 Test connection

1, EUT was placed on a turn table, which is 0.8 meter high above ground.

TX Mode:



4.3 Assistant equipment used for test

Description	:	N/A
Manufacturer	:	N/A
Model No.	:	N/A

4.4 Test mode

The EUT was used to control EUT work in Continuous TX mode, and select test channel, wireless mode

All buttons related RF functions has been tested, and only worst data listed in report.

Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2404	24	2430	47	2459
2	2405	25	2434	48	2460
3	2406	26	2435	49	2461
4	2407	27	2436	50	2462
5	2408	28	2437	51	2466
6	2409	29	2438	52	2467
7	2410	30	2439	53	2468
8	2411	31	2440	54	2469
9	2412	32	2441	55	2470
10	2413	33	2442	56	2471
11	2414	34	2443	57	2472
12	2418	35	2444	58	2473
13	2419	36	2445	59	2474
14	2420	37	2446	60	2475
15	2421	38	2450	61	2476
16	2422	39	2451	62	2477
17	2423	40	2452	63	2478
18	2424	41	2453	64	2479
19	2425	42	2454	65	2480
20	2426	43	2455	/	/
21	2427	44	2456	/	/
22	2428	45	2457	/	/

4.5 Test Conditions

Temperature range	21-25℃
Humidity range	40-75%
Pressure range	86-106kPa

4.6 Measurement Uncertainty (95% confidence levels, k=2)

Item	MU	Remark
Uncertainty for Power point Conducted Emissions Test	2.42dB	
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB	Polarize: V
	2.57dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.54dB	Polarize: V
	4.1dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	2.08dB	Polarize: H
	2.56dB	Polarize: V
Uncertainty for radio frequency	1×10-9	
Uncertainty for DC and low frequency voltages	0.06%	

2 Radiation Emission

2.1 Radiation Emission Limits(15.209&249)

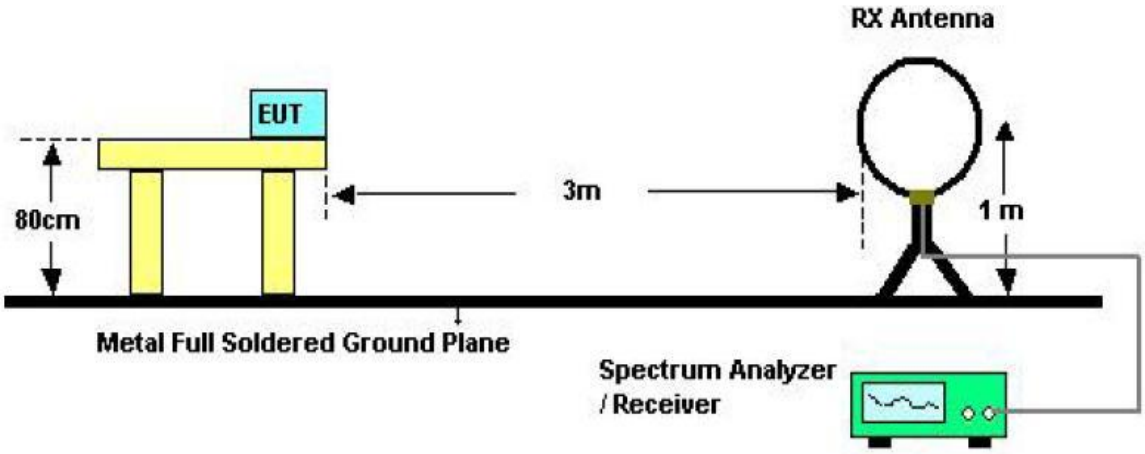
Frequency (MHz)	**Field Strength Limits at 3 metres (watts, e.i.r.p.)**		
	uV/m	dB uV/m	Measurement distance(m)
0.009-0.490	2400/F(kHz)	XX	300
0.490-1.705	24000/F(kHz)	XX	30
1.705-30	30	29.5	30
30~88	100(3nW)	40	3
88~216	150(6.8nW)	43.5	3
216~960	200(12nW)	46	3
Above960	500(75nW)	54	3
Carrier frequency		93.97(AV)	3
Carrier frequency		113.97(PK)	3

NOTE:

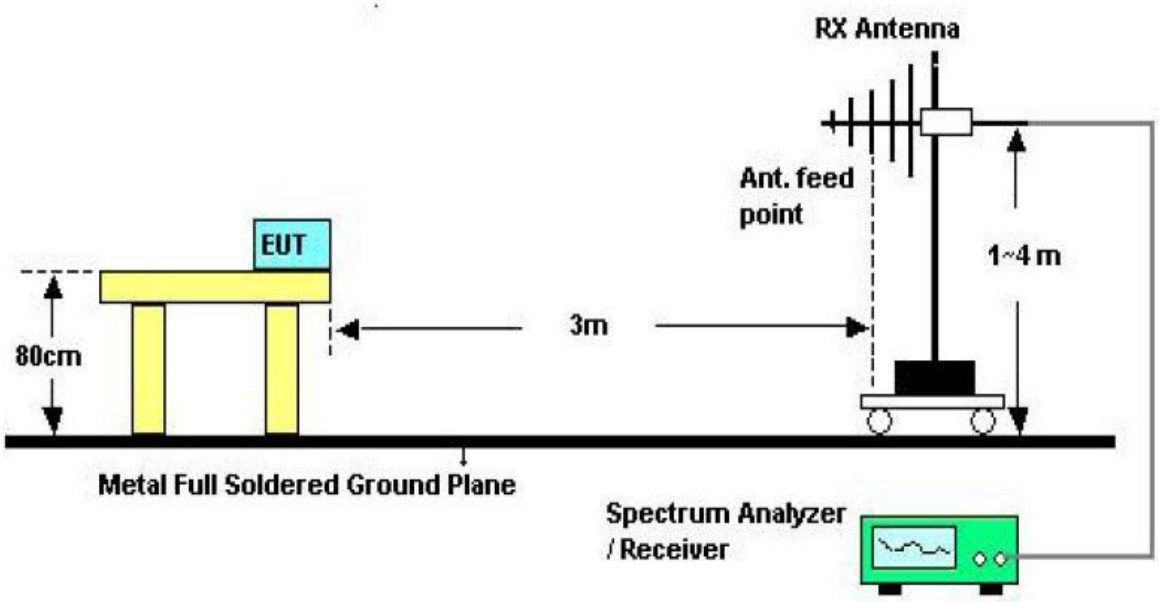
a) The tighter limit applies at the band edges.

b) Emission Level(dB uV/m)=20log Emission Level(Uv/m)

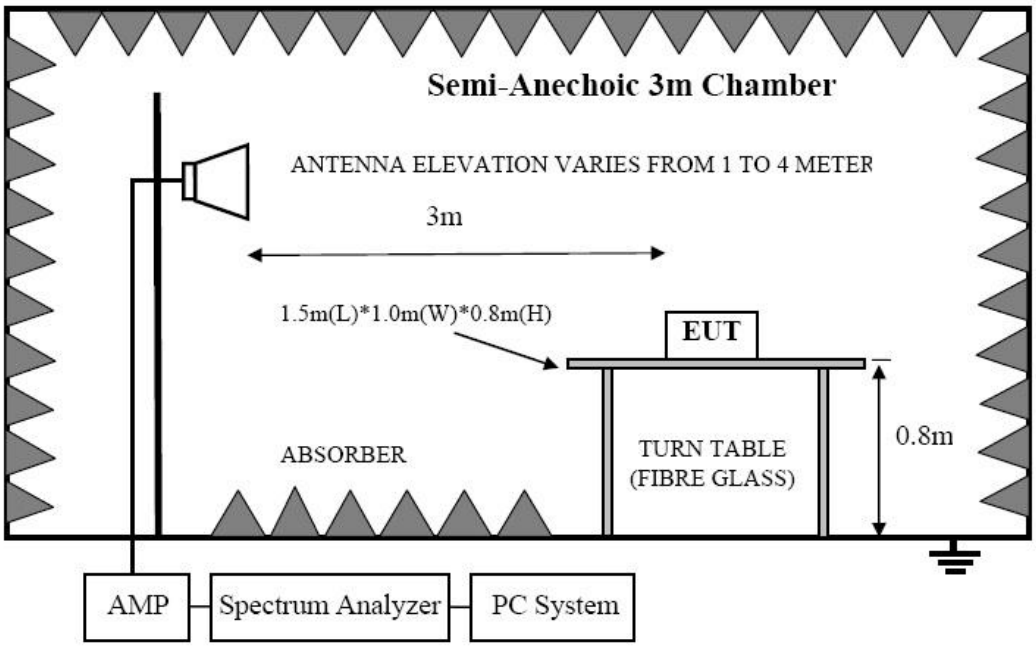
2.2 Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

2.3 Test Procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.

(2) For the actual test configuration, please see the test setup photo.

(3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.

(a) Change work frequency or channel of device if practicable.

(b) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

(4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated

(5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.4 2009 on Radiated Emission test.

(6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

(7) For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane

2.4 Test Equipment Setting For emission test.

9KHz~150KHz	RBW 200Hz	VBW 1KHz
150KHz~30MHz	RBW 9KHz	VBW 30KHz
30MHZ~1GHz	RBW 120KHz	VBW 300KHz
Above 1GHz	RBW 1MHz	VBW 3MHz

2.5 Test Condition

Continual Transmitting in maximum power.

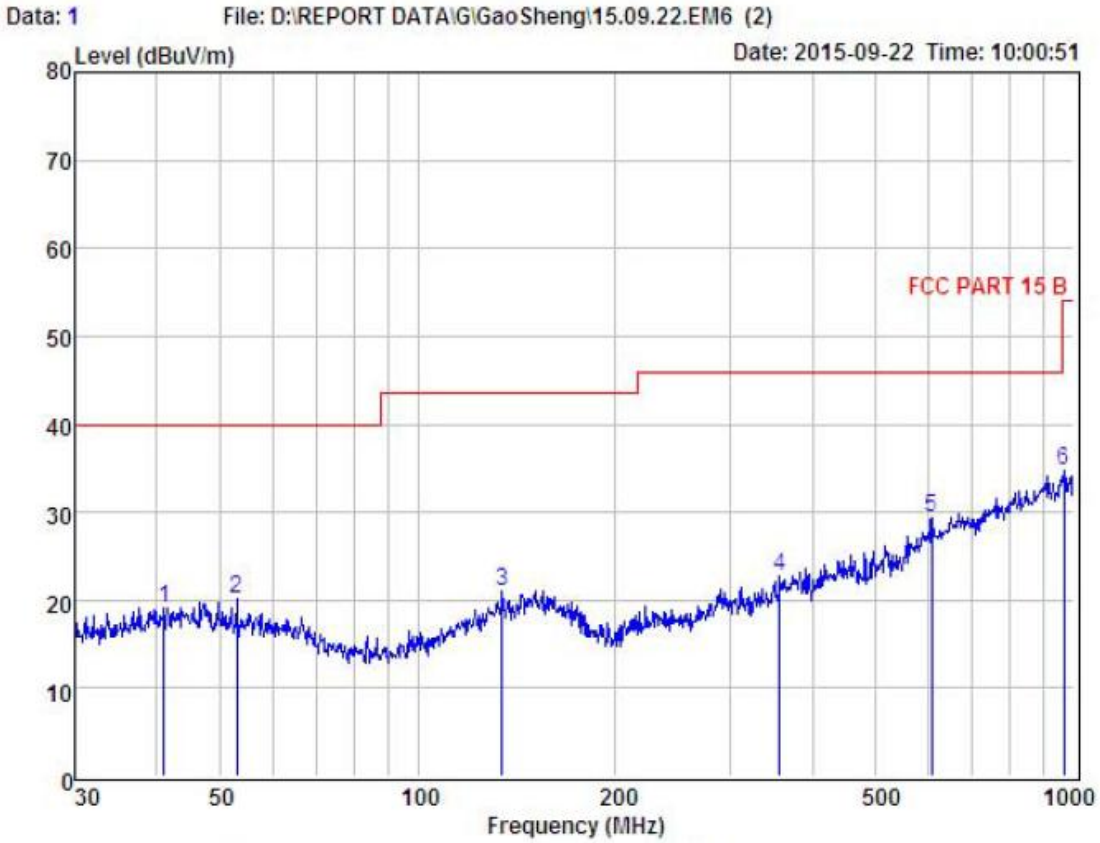
2.6 Test Result

PASS.

Note: The Radiated emissions is showed the maximum power data of TX test mode and showed worst orthogonal axes with Z orthogonal axes.

From 9KHz to 30MHz: Conclusion: **PASS**

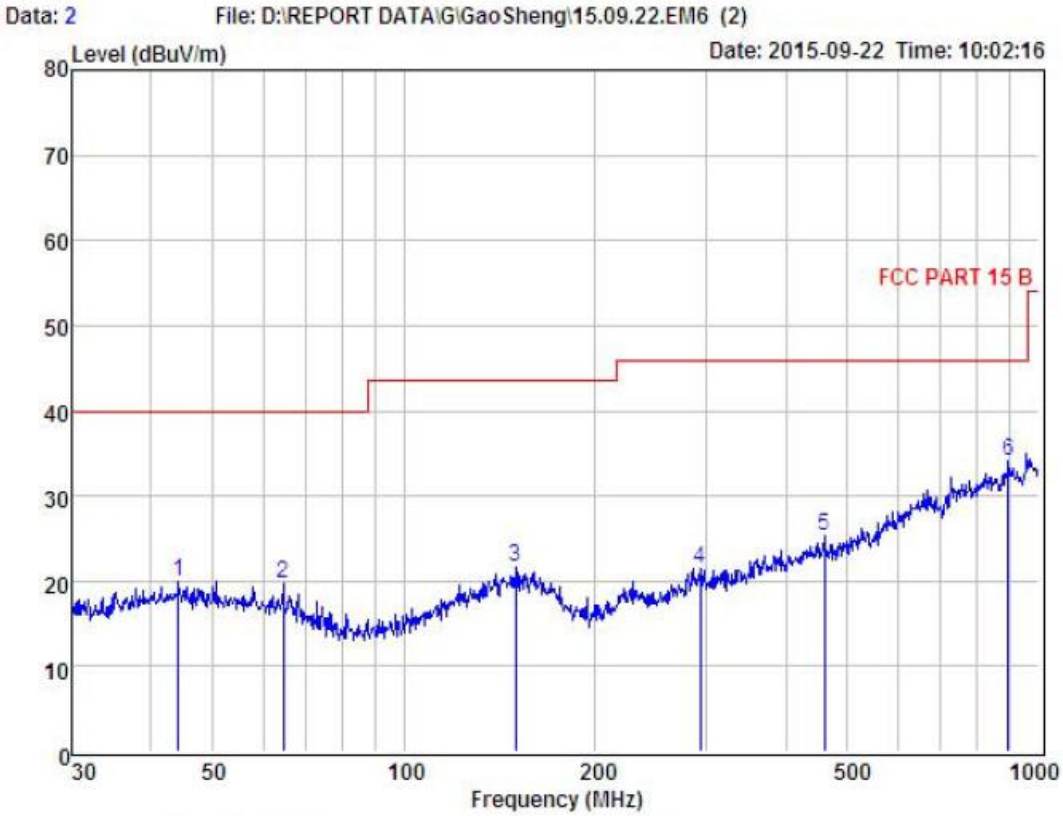
Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



Condition : FCC PART 15 B 3m POL: HORIZONTAL
EUT :
Model No :
Test Mode :
Power :
Test Engineer :
Remark :
Temp : 24.2℃
Hum : 54%

Item	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	40.99	35.91	13.93	30.85	0.18	19.17	40.00	-20.83	Peak
2	52.95	37.39	13.22	30.63	0.22	20.20	40.00	-19.80	Peak
3	134.56	36.82	13.08	29.44	0.46	20.92	43.50	-22.58	Peak
4	356.68	35.79	13.95	27.72	0.66	22.68	46.00	-23.32	Peak
5	607.79	35.53	18.47	25.88	1.24	29.36	46.00	-16.64	Peak
6	965.54	35.57	22.19	25.04	1.97	34.69	54.00	-19.31	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss



Condition : FCC PART 15 B 3m POL: VERTICAL
EUT :
Model No :
Test Mode :
Power :
Test Engineer :
Remark :
Temp : 24.2℃
Hum : 54%

Item	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	44.12	36.18	13.79	29.96	0.03	20.04	40.00	-19.96	Peak
2	64.66	38.31	11.59	30.52	0.25	19.63	40.00	-20.37	Peak
3	150.01	36.51	14.16	29.45	0.39	21.61	43.50	-21.89	Peak
4	293.08	36.18	12.67	28.04	0.70	21.51	46.00	-24.49	Peak
5	459.11	35.53	16.06	27.44	1.10	25.25	46.00	-20.75	Peak
6	893.86	36.55	21.56	25.09	1.19	34.21	46.00	-11.79	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Notes: Above is below 1GHz test data. This report only shall the worst case mode for TX 2404MHz.

Radiated Emissions Result of Inside band (2404MHz)

EUT	2.4G remote controller	**Model Name**	MX3-V
Temperature	25°C	**Relative Humidity**	56%
Pressure	960hPa	**Test voltage**	DC 3V from battery
Test Mode	TX Low	**Antenna polarization**	Horizontal/Vertical

Channel Low(2404MHz)									
Fre. MHz	**Plority H/V**	**Reading dBuV**	**Antenna Factor dB**	**Cable Loss dB**	**Amplifier Gain dB**	**Correct Factor dB**	**Measure Result dBuV/m**	**Limit dBuV/m**	**Margin dB**
2404	H	88.96（PK）	27.61	3.92	34.97	-3.44	85.52	113.97	-28.45
2404	H	80.75(AV)	27.61	3.92	34.97	-3.44	77.31	93.97	-16.66
--	H	--	--	--	--	--	--	--	--
2404	V	87.93（PK）	27.61	3.92	34.97	-3.44	84.49	113.97	-29.48
2404	V	79.05(AV)	27.61	3.92	34.97	-3.44	75.61	93.97	-18.36
--	V	--	--	--	--	--	--	--	--

Freq. (MHz)	**Ant. Pol H/V**	**Peak Reading (dBuV)**	**AV Reading (dBuV)**	**Ant. / CL CF (dB)**	**Actual Fs**		**Peak Limit (dBuV/m)**	**AV Limit (dBuV/m)**	**Margin (dB)**	**Remark**
					Peak (dBuV/m)	**AV (dBuV/m)**				
1489.53	H	52.21	---	-10.27	41.94	---	74.00	54.00	-12.06	Peak
1942.13	H	51.62	---	-8.86	42.76	---	74.00	54.00	-11.24	Peak
2654.72	H	48.36	---	-6.94	41.42	---	74.00	54.00	-12.58	Peak
4808.00	H	43.4	---	0.64	44.04	---	74.00	54.00	-9.96	Peak
N/A										
1218.43	V	51.56	---	-11.52	40.04	---	74.00	54.00	-13.96	Peak
1821.56	V	51.30	---	-9.16	42.14	---	74.00	54.00	-11.86	Peak
2794.23	V	49.81	---	-6.38	43.43	---	74.00	54.00	-10.57	Peak
4808.00	V	44.09		0.64	44.73	---	74.00	54.00	-9.27	Peak
N/A										

Notes: 1 --Means other frequency and mode comply with standard requirements and at least have 20dB margin. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain
Measurement Result=Reading + Correct Factor
Margin=Measurement Result-Limit

2 –Spectrum setting:

a. Peak setting 30MHz-1GHz, RBW=120KHz, VBW=300KHz.
Above 1G: RBW=1MHz, VBW=3MHz

b. AV setting 30MHz-1GHz, RBW=1MHz, VBW=10Hz.
Above 1G: RBW=1MHz, VBW=10Hz

Radiated Emissions Result of Inside band (2440MHz)

EUT	2.4G remote controller	**Model Name**	MX3-V
Temperature	25°C	**Relative Humidity**	56%
Pressure	960hPa	**Test voltage**	DC 3V from battery
Test Mode	TX Mid	**Antenna polarization**	Horizontal/Vertical

Channel Low(2440MHz)									
Fre. MHz	**Plority H/V**	**Reading dBuV**	**Antenna Factor dB**	**Cable Loss dB**	**Amplifier Gain dB**	**Correct Factor dB**	**Measure Result dBuV/m**	**Limit dBuV/m**	**Margin dB**
2440	H	90.32（PK）	27.61	3.96	34.97	-3.4	86.92	113.97	-27.05
2440	H	85.46 (AV)	27.61	3.96	34.97	-3.4	82.06	93.97	-11.91
--	H	--	--	--	--	--	--	--	--
2440	V	89.86（PK）	27.61	3.96	34.97	-3.4	86.46	113.97	-27.51
2440	V	82.28 (AV)	27.61	3.96	34.97	-3.4	78.88	93.97	-15.09
--	V	--	--	--	--	--	--	--	--

Freq. (MHz)	**Ant. Pol H/V**	**Peak Reading (dBuV)**	**AV Reading (dBuV)**	**Ant. / CL CF (dB)**	**Actual Fs**		**Peak Limit (dBuV/m)**	**AV Limit (dBuV/m)**	**Margin (dB)**	**Remark**
					Peak (dBuV/m)	**AV (dBuV/m)**				
1231.29	H	52.98	---	-11.52	41.46	---	74.00	54.00	-12.54	Peak
2215.05	H	50.74	---	-8.13	42.61	---	74.00	54.00	-11.39	Peak
2932.16	H	48.34	---	-5.72	42.62	---	74.00	54.00	-11.38	Peak
4880.00	H	44.41	---	0.83	45.24	---	74.00	54.00	-8.76	Peak
N/A										
1305.47	V	53.06	---	-10.84	42.22	---	74.00	54.00	-11.78	Peak
2306.43	V	48.89	---	-7.46	41.43	---	74.00	54.00	-12.57	Peak
3145.07	V	48.05	---	-5.63	42.42	---	74.00	54.00	-11.58	Peak
4880.00	V	44.01		0.83	44.84	---	74.00	54.00	-9.16	Peak
N/A										

Notes: 1 --Means other frequency and mode comply with standard requirements and at least have 20dB margin. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain
Measurement Result=Reading + Correct Factor
Margin=Measurement Result-Limit

2 –Spectrum setting:

a. Peak setting 30MHz-1GHz, RBW=120KHz, VBW=300KHz.
Above 1G: RBW=1MHz, VBW=3MHz

b. AV setting 30MHz-1GHz, RBW=1MHz, VBW=10Hz.
Above 1G: RBW=1MHz, VBW=10Hz

Radiated Emissions Result of Inside band (2480MHz)

EUT	2.4G remote controller	**Model Name**	MX3-V
Temperature	25°C	**Relative Humidity**	56%
Pressure	960hPa	**Test voltage**	DC 3V from battery
Test Mode	TX High	**Antenna polarization**	Horizontal/Vertical

Channel Low(2480MHz)									
Fre. MHz	**Plority H/V**	**Reading dBuV**	**Antenna Factor dB**	**Cable Loss dB**	**Amplifier Gain dB**	**Correct Factor dB**	**Measure Result dBuV/m**	**Limit dBuV/m**	**Margin dB**
2480	H	87.73（PK）	27.82	3.98	34.97	-3.17	84.56	113.97	-29.41
2480	H	80.15 (AV)	27.82	3.98	34.97	-3.17	76.98	93.97	-16.99
--	H	--	--	--	--	--	--	--	--
2480	V	84.42（PK）	27.82	3.98	34.97	-3.17	81.25	113.97	-32.72
2480	V	79.58 (AV)	27.82	3.98	34.97	-3.17	76.41	93.97	-17.56
--	V	--	--	--	--	--	--	--	--

Freq. (MHz)	**Ant. Pol H/V**	**Peak Reading (dBuV)**	**AV Reading (dBuV)**	**Ant. / CL CF (dB)**	**Actual Fs**		**Peak Limit (dBuV/m)**	**AV Limit (dBuV/m)**	**Margin (dB)**	**Remark**
					Peak (dBuV/m)	**AV (dBuV/m)**				
1256.33	H	52.32	---	-10.96	41.36	---	74.00	54.00	-12.64	Peak
1954.17	H	50.88	---	-8.64	42.24	---	74.00	54.00	-11.76	Peak
2915.74	H	48.47	---	-5.95	42.52	---	74.00	54.00	-11.48	Peak
4960.00	H	46.84	---	0.87	47.71	---	74.00	54.00	-6.29	Peak
N/A										
1294.75	V	53.60	---	-10.96	42.64	---	74.00	54.00	-11.36	Peak
2106.41	V	51.94	---	-8.36	43.58	---	74.00	54.00	-10.42	Peak
3257.22	V	46.95	---	-5.39	41.56	---	74.00	54.00	-12.44	Peak
4960.00	V	45.48		0.87	46.35	---	74.00	54.00	-7.65	Peak
N/A										

Notes: 1 --Means other frequency and mode comply with standard requirements and at least have 20dB margin. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain
Measurement Result=Reading + Correct Factor
Margin=Measurement Result-Limit

2 –Spectrum setting:

a. Peak setting 30MHz-1GHz, RBW=120KHz, VBW=300KHz.
Above 1G: RBW=1MHz, VBW=3MHz

b. AV setting 30MHz-1GHz, RBW=1MHz, VBW=10Hz.
Above 1G: RBW=1MHz, VBW=10Hz

3 POWER LINE CONDUCTED EMISSION

3.1 Conducted Emission Limits(15.207)

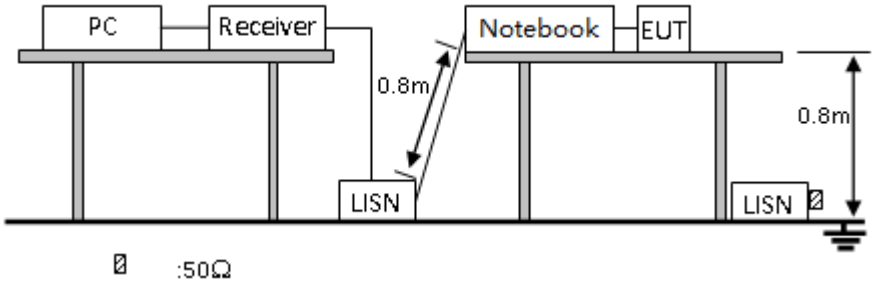
Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

3.2 Test Setup



3.3 Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4-2009 on Conducted Emission Measurement.
The bandwidth of test receiver (R & S ESCS30) is set at 9 kHz.

3.4 Test Results

Not Apply to battery operated product

4 Occupied bandwidth

4.1 Test limit

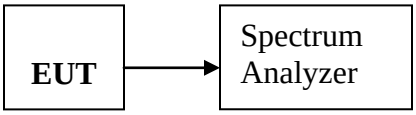
Please refer section15.249

4.2 Method of measurement

a)The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

b)The test receiver RBW set 100KHz,VBW set 300KHz,Sweep time set auto.

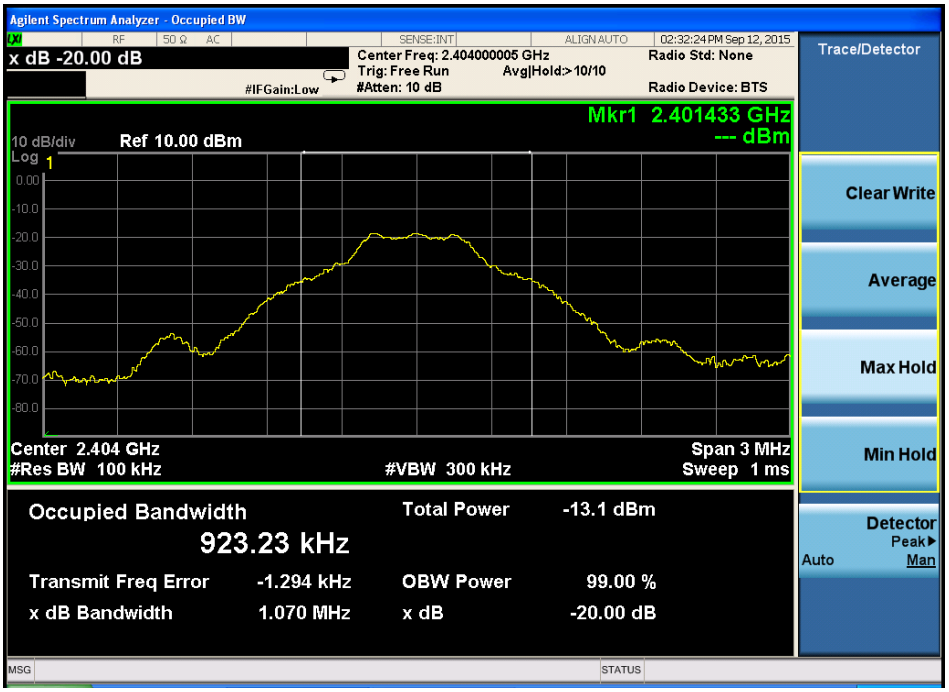
4.3 Test Setup

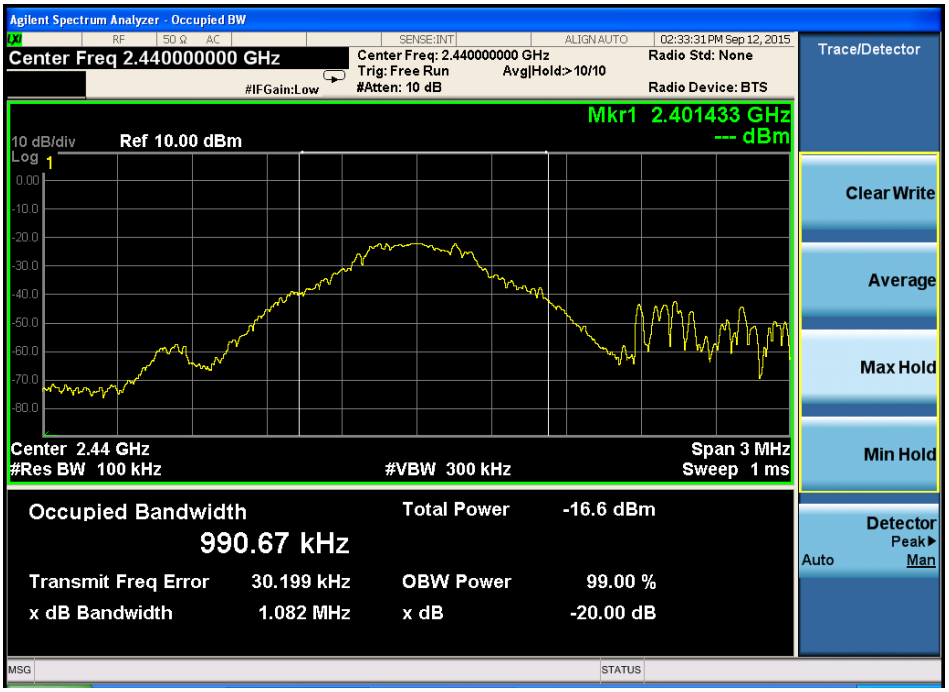


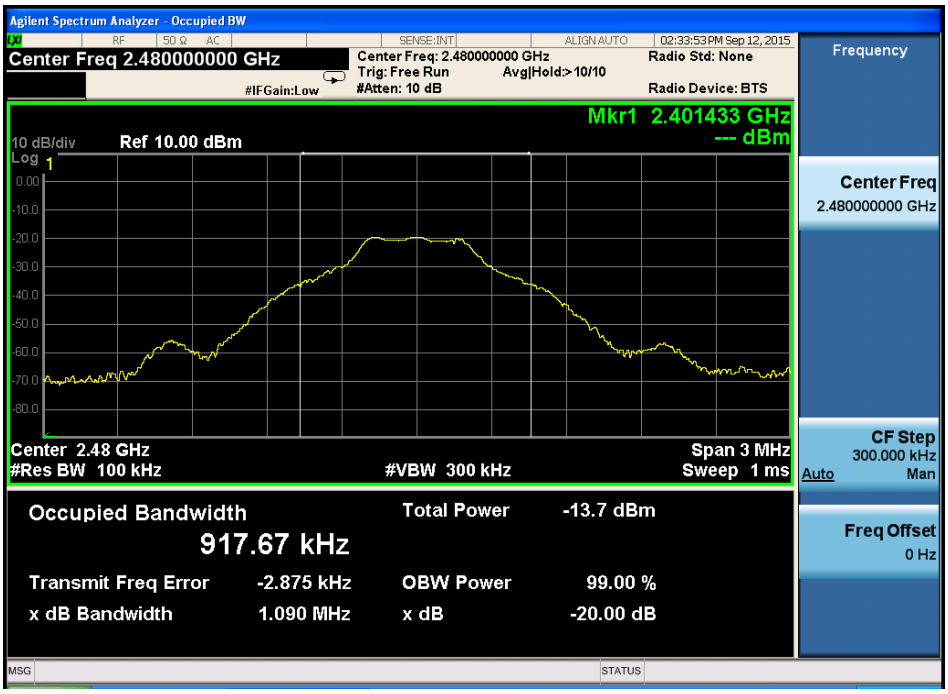
4.4 Test Results

PASS.

Mode	Freq (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (kHz)	Conclusion
FSK	2404	1.070	/	/	PASS
	2440	1.082	/	/	PASS
	2480	1.090	/	/	PASS
Note: Detailed information please see the following page.					


Agilent Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
02:32:24 PM Sep 12, 2015
x dB -20.00 dB
Center Freq: 2.404000005 GHz
Trig: Free Run Avg|Hold:>10/10
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
Mkr1 2.401433 GHz
--- dBm
10 dB/div
Ref 10.00 dBm
Log
1
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.404 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
923.23 kHz
Total Power -13.1 dBm
Transmit Freq Error -1.294 kHz
OBW Power 99.00 %
x dB Bandwidth 1.070 MHz
x dB -20.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Peak
Auto
Man
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
02:33:31 PM Sep 12, 2015
Center Freq 2.440000000 GHz
Center Freq: 2.440000000 GHz
Trig: Free Run Avg|Hold:>10/10
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Trace/Detector
Mkr1 2.401433 GHz
--- dBm
10 dB/div
Ref 10.00 dBm
Log
1
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.44 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
990.67 kHz
Total Power -16.6 dBm
Transmit Freq Error 30.199 kHz
OBW Power 99.00 %
x dB Bandwidth 1.082 MHz
x dB -20.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Peak
Auto
Man
MSG
STATUS


Agilent Spectrum Analyzer - Occupied BW
RF
50 Ω
AC
SENSE:INT
ALIGN AUTO
02:33:53 PM Sep 12, 2015
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Frequency
Mkr1 2.401433 GHz
--- dBm
10 dB/div
Log
Ref 10.00 dBm
1
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
917.67 kHz
Total Power
-13.7 dBm
Transmit Freq Error
-2.875 kHz
OBW Power
99.00 %
x dB Bandwidth
1.090 MHz
x dB
-20.00 dB
Center Freq
2.480000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

5 Band Edge Check

5.1 Test limit

Please refer section15.249 and section 15.205.

249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

249(e) As show in section 15.35(b), for frequencies above 1000MHz,the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak filed strength shall not exceed 2500 millivolts/meter at 3meters along the antenna azimuth.

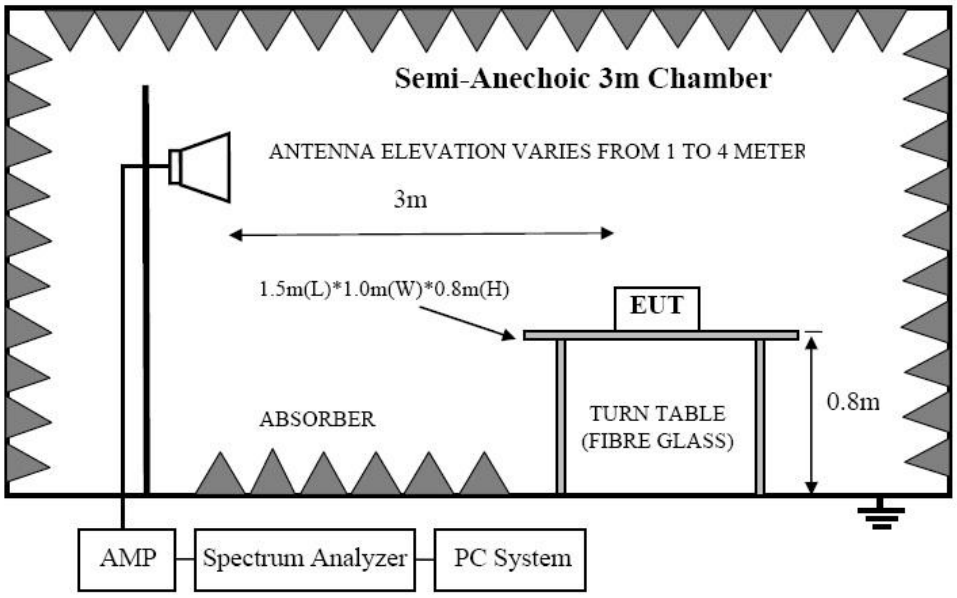
5.2 Test Procedure

All restriction band and non- restriction band have been tested ， only worse case is reported.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

5.3 Test Setup



5.4 Test Result

Pass.

Radiated Method

Band Edge Test result								
EUT: 2.4G remote controller M/N: MX3-V								
Power: DC 3V from battery								
Test date: 2015-09-22 Test site: 3m Chamber Tested by: peter								
Test mode: Tx CH Low 2404MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390	41.11	27.62	3.92	34.97	37.68	74	36.32	PK
2390	--	27.62	3.92	34.97	--	54	--	AV
2400	50.84	27.62	3.94	34.97	47.43	74	26.57	PK
2400	--	27.62	3.94	34.97	--	54	--	AV
Antenna Polarity: Horizontal								
2390	39.9	27.62	3.92	34.97	36.47	74	37.53	PK
2390	--	27.62	3.92	34.97	--	54	--	AV
2400	49.8	27.62	3.94	34.97	46.39	74	27.61	PK
2400	--	27.62	3.94	34.97	--	54	--	AV
Note: 1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK 2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK 3, Result = Read level + Antenna factor + cable loss-Amp factor 4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.								

Band Edge Test result								
EUT: 2.4G remote controller M/N: MX3-V								
Power: DC 3V from battery								
Test date: 2015-09-22 Test site: 3m Chamber Tested by: peter								
Test mode: Tx CH High 2480MHz								
Antenna polarity: Vertical								
Freq (MHz)	Read Level (dBuV/m)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2483.5	41.96	27.89	4	34.97	38.88	74	35.12	**PK**
2483.5		--	--	--	--	54	--	AV
Antenna Polarity: Horizontal								
2483.5	41.51	27.89	4	34.97	38.43	74	35.57	**PK**
2483.5		--	--	--	--	54	--	AV

Note:
1, Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK
2, Spectrum Set for AV measure: RBW=1MHz, VBW=10Hz, Sweep time=Auto, Detector: PK
3, Result = Read level + Antenna factor + cable loss-Amp factor
4, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

6 Antenna Requirement

6.1 Standard Requirement

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.

6.2 Antenna Connected Construction

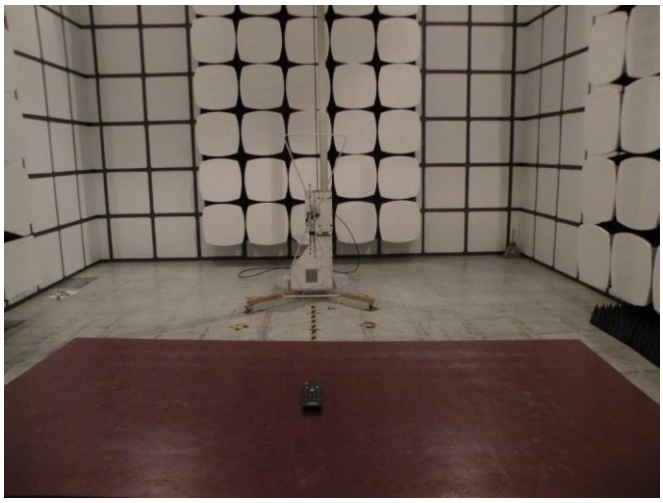
The directional gains of antenna used for transmitting is -3dBi, and the antenna is PCB antenna no consideration of replacement. Please see EUT photo for details.

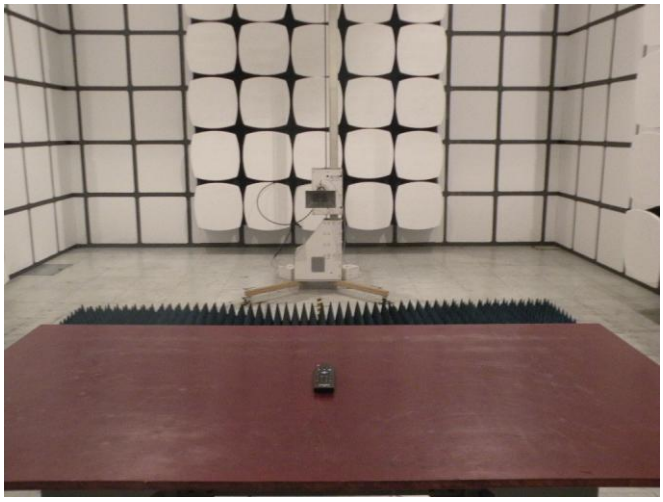
6.3 Result

The EUT antenna is PCB Antenna. It comply with the standard requirement.

7 Photographs of Test Setup

Photographs-Radiated Emission Test Setup in Chamber





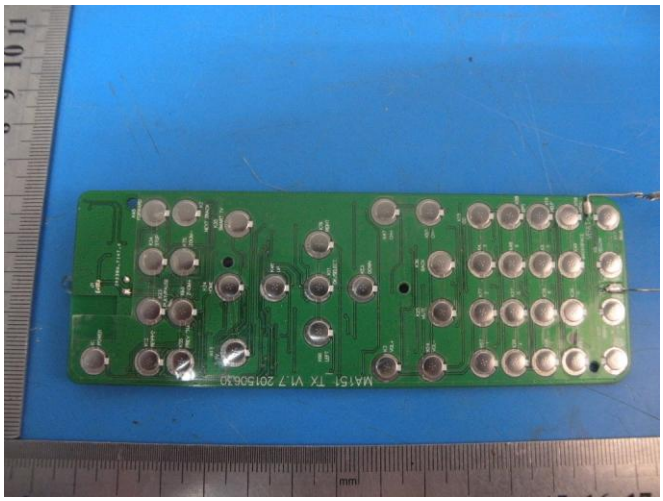
8 Photographs of EUT

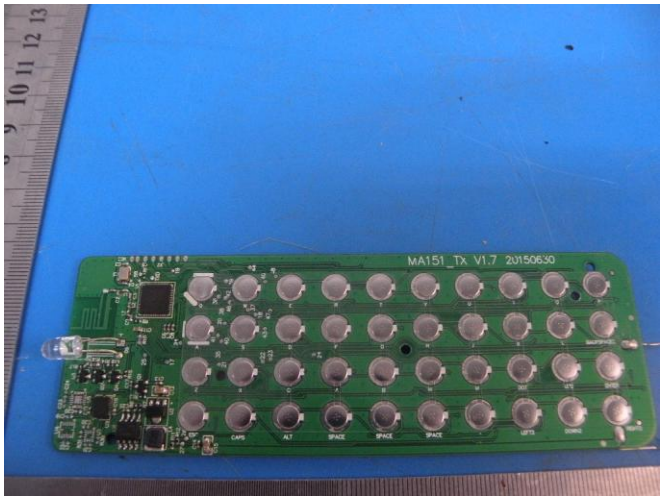

acentic
Powered by viggo
PREV
SUBTL
GUIDE
MENU
0.5 mm


acentic
OK
SELECT
SMART TV
HELP
MENU
SUBTL
GUIDE


SMART TV
HELP
INFO
TV
OK
SELECT


oceanic
INFO
OK
SELECT
VOL+
VOL-
PREV





------THE END OF REPORT-------