

Guangdong Meijiixin Innovative Technology Co., Ltd.

RF TEST REPORT

Report Type:

FCC Part 15.249 RF report

Model:

GR811

REPORT NUMBER:

200602836SHA-001

ISSUE DATE:

August 19, 2020

DOCUMENT CONTROL NUMBER:

TTRF15.249_V1 © 2018 Intertek



Applicant: Guangdong Meijiixin Innovative Technology Co., Ltd.
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Manufacturer: Guangdong Meijiixin Innovative Technology Co., Ltd.
Address of Manufacturer: Xingye South Road, Laimei Industrial Park, Chenghai, Shantou, Guangdong, China
FCC ID: 2AHV3KK22

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2019): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:**REVIEWED BY:**

Project Engineer

Wade Zhang



Reviewer

Daniel Zhao

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
200602836SHA-001	Rev. 01	Initial issue of report	August 19, 2020

Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Radiated emission	15.249 & 15.209	Pass
Power line conducted emission	15.207	NA (Note 1,2)
Assigned bandwidth (20dB bandwidth)	15.215(c)	Pass
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable


2: The battery needs to be removed from the EUT when charging, so there is no transmitting when charging

3. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

4. Additions, Deviations and Exclusions from Standards: None.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	2.4G remote control
Type/Model:	GR811
Trade Mark:	
Add Model:	N/A
Description of EUT:	The EUT is an 2.4G remote control with general 2.4G technology.
Rating:	DC 3.0V (Powered by a 1.5AA*2 Battery)
Category of EUT:	Class B
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Sample received date:	May 14, 2020
Date of test:	May 15, 2020 ~ June 20, 2020

1.2 Technical Specification

Frequency Range:	2452MHz ~ 2474MHz (Randomly select 4 channels to use)
Support Standards:	General 2.4GHz Technique
Channel Number:	23
Channel Separation:	1 MHz
Antenna Information:	External antenna, 2dBi Peak gain

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1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab Registration code No.: 2042B-1
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	A2LA Accreditation Lab Certificate Number: 3309.02

Tests were sub-contracted.

Name:	Shenzhen UnionTrust Quality and Technology Co., Ltd.
Address:	16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
Telephone:	+86 (0) 755 2823 0888
Telefax:	+86 (0) 755 2823 0886

The test facility is recognized, certified, or accredited by these organizations:	A2LA-Lab Certificate No.:4312.01
	Registration No. CNAS L9069

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2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2017)

ANSI C63.10 (2013)

2.2 Mode of operation during the test

The EUT is a handheld device, so three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2452	13	2465
1	2453	14	2466
2	2454	15	2467
3	2455	16	2468
4	2456	17	2469
5	2457	18	2470
6	2458	19	2471
7	2459	20	2472
8	2460	21	2473
9	2461	22	2474
10	2462		
11	2463		
12	2464		

Remark: According to declared of equipment manufacturer, this EUT operation frequency range is 2452 MHz to 2474 MHz, the number of channels available is 23, and channel separation is 1 MHz, but when the product is power on, only 4 of the 23 channels are chosen, and the channel spacing is greater than or equal to 1MHz

The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter			
Test Software	None		
Working Mode	Continue TX Mode		
Test Channel	2452MHz	2463MHz	2474MHz
Power Setting	not applicable, test used default power level.		

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

- 1) Radiated test mode: EUT transmitted signal with antenna;
- 2) Conducted test mode: EUT transmitted signal from RF port connected to SPA directly;

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2.3 Test peripherals list

Item No.	Name	Band and Model	Description
1	NoteBook	Lenovo, E450	AC 120V 60Hz
Note: The NoteBook only used for control RF setting, not used during the test.			

2.4 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	24°C	54% RH
Assigned bandwidth (20dB bandwidth)	25°C	54% RH

2.5 Instrument list

Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 03, 2021
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	UTTTL-E026	Nov. 23, 2020
<input checked="" type="checkbox"/>	Loop Antenna	ETS-LINDGREN	6502	UTTTL-E013	Nov. 15, 2020
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	UTTTL-E014	Nov. 15, 2020
<input checked="" type="checkbox"/>	6dB Attenuator	Talent	RA6A5-N-18	UTTTL-E057	Nov. 15, 2020
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	UTTTL-E043	Nov. 23, 2020
<input checked="" type="checkbox"/>	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117	UTTTL-E016	May 17, 2021
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-LINDGREN	118385	UTTTL-E017	Jan. 10, 2021
<input checked="" type="checkbox"/>	Double-Ridged Waveguide Horn Antenna	ETS-LINDGREN	3116C-PA	UTTTL-E019	Nov. 15, 2020
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-LINDGREN	00118384		
<input checked="" type="checkbox"/>	Multi device Controller	ETS-LINDGREN	7006-001	N/A	N/A
e3		Audix		Software Version: 9.160323	

RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9010A	UTTTL-E032	Nov. 23, 2020
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	UTTTL-E005	Nov. 23, 2020
<input checked="" type="checkbox"/>	USB Wideband Power Sensor	KEYSIGHT	U2021XA	UTTTL-E033	Nov. 23, 2020

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2.6 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Conducted emission 150KHz-30MHz	±2.7 dB
Radiated emission 9KHz-30MHz	±4.7 dB
Radiated emission 30MHz-1GHz	±4.7 dB
Radiated emission 1GHz-18GHz	±5.1 dB
Radiated emission 18GHz-26GHz	±5.2 dB
Radiated emission 26GHz-40GHz	±5.2 dB

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3 Radiated emission

Test result: Pass

3.1 Limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
<input type="checkbox"/> 902 - 928	94	54
<input checked="" type="checkbox"/> 2400 - 2483.5	94	54
<input type="checkbox"/> 5725 - 5875	94	54
<input type="checkbox"/> 24000 - 24250	108	68

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits:

Frequencies (MHz)	Field Strength (microvolts/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

3.2 Measurement Procedure

For Radiated emission below 30MHz:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

TEST REPORT**For Radiated emission above 30MHz:**

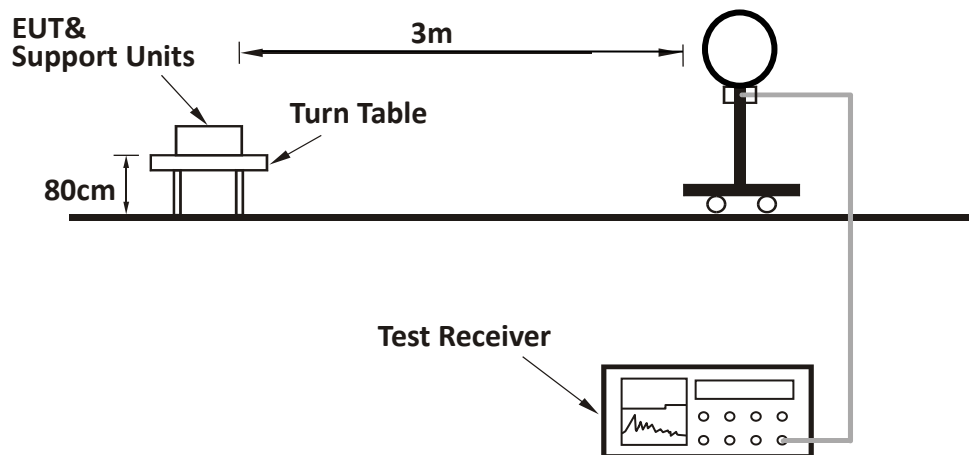
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

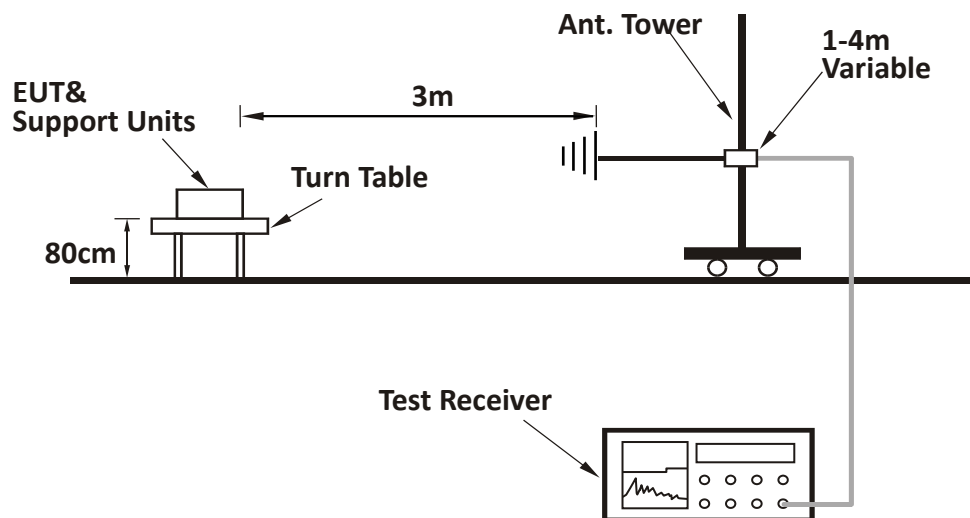
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is above 20dB bandwidth and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is above 20dB bandwidth and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 3 x RBW (Duty cycle \geq 98%) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported

3.3 Test Configuration

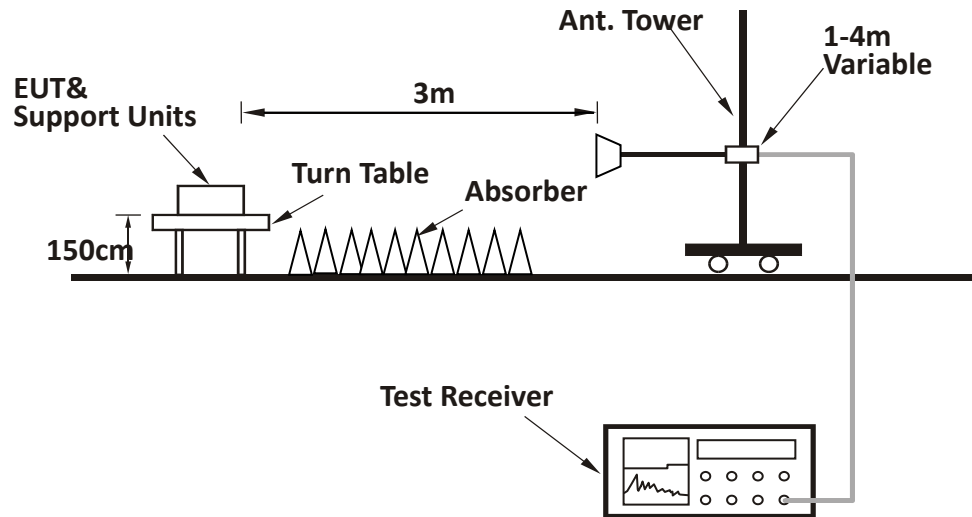
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

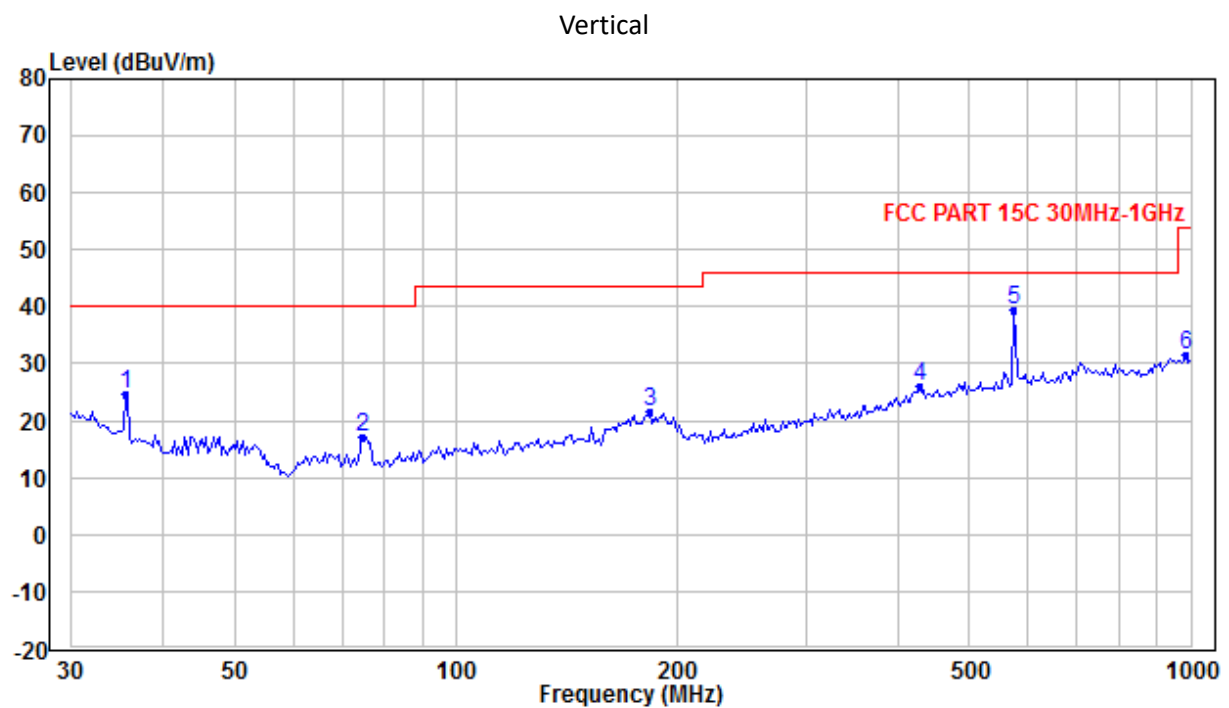
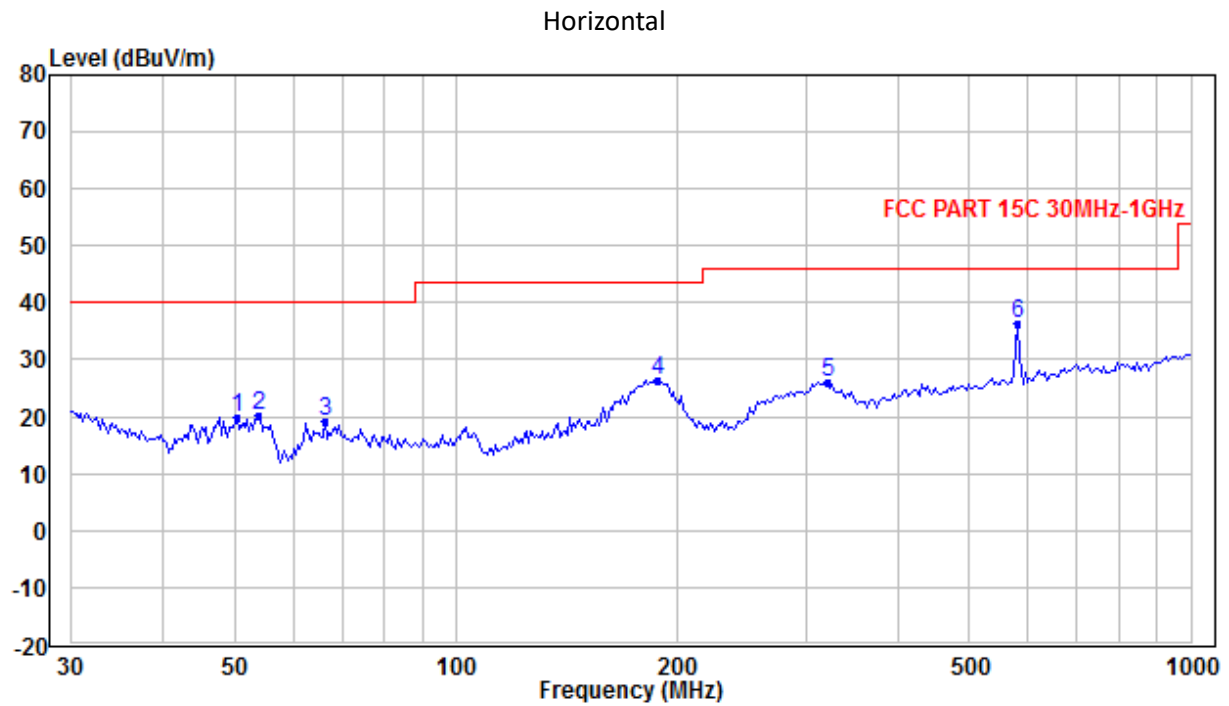


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3.4 Test Results of Radiated Emissions

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:



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Test data below 1GHz

Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	50.461	19.95	-15.42	40.00	20.05	QP
	53.756	20.12	-15.56	40.00	19.88	QP
	66.371	19.05	-15.71	40.00	20.95	QP
	187.783	26.49	-10.43	43.50	17.01	QP
	320.331	25.97	-5.26	46.00	20.03	QP
	582.112	36.24	-0.10	46.00	9.76	QP
V	35.511	24.61	-8.99	40.00	15.39	QP
	74.793	17.01	-14.75	40.00	22.99	QP
	183.866	21.56	-10.58	43.50	21.94	QP
	427.292	25.93	-3.26	46.00	20.07	QP
	573.988	39.36	-0.11	46.00	6.64	QP
	986.044	31.51	6.15	54.00	22.49	QP

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Test result above 1GHz:

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2400.00	47	-1.04	74.00	27.00	PK
	V	2400.00	48.62	-1.47	74.00	25.38	PK
	H	2452.00	78.16	-0.90	114.00	35.84	PK
	V	2452.00	78.33	-1.31	114.00	35.67	PK
	H	4904.000	61.54	3.74	74.00	12.46	PK
	H	4904.000	39.64	3.74	54.00	14.36	AV
	V	4904.000	68.64	3.94	74.00	5.36	PK
	V	4904.000	45.19	3.94	54.00	8.81	AV
	H	7356.000	47.65	6.36	74.00	26.35	PK
	V	7356.000	45.85	6.46	74.00	28.15	PK
M	H	2463.026	80.53	-0.91	114.00	33.47	PK
	V	2463.026	80.35	-1.32	114.00	33.65	PK
	H	4926.000	59.83	3.71	74.00	14.17	PK
	H	4926.000	38.81	3.71	54.00	15.19	AV
	V	4926.000	71.09	3.93	74.00	2.91	PK
	V	4926.000	46.81	3.93	54.00	7.19	AV
	H	7389.000	48.51	6.45	74.00	25.49	PK
	V	7389.000	47.59	6.45	74.00	26.41	PK
H	H	2474.028	79.04	-0.91	114.00	34.96	PK
	V	2474.028	80.31	-1.31	114.00	33.69	PK
	H	2483.500	46.4	-0.90	74.00	27.60	PK
	V	2483.500	46.62	-1.31	74.00	27.38	PK
	H	4944.000	58.42	3.68	74.00	15.58	PK
	H	4944.000	38.02	3.68	54.00	15.98	AV
	V	4944.000	71.02	3.92	74.00	2.98	PK
	V	4944.000	47.96	3.92	54.00	6.04	AV
	H	7416.000	47.87	6.34	74.00	26.13	PK
	V	7416.000	46.94	6.44	74.00	27.06	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

5. AV Reading = PK Reading + Duty cycle factor.

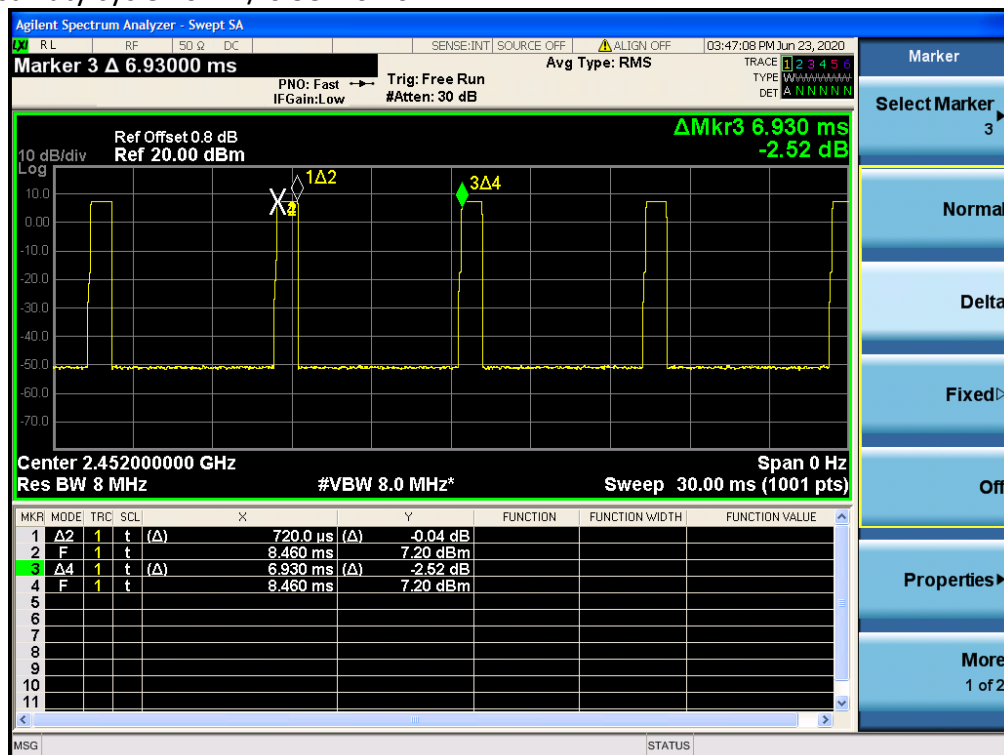
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Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
 Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
 Limit = 40.00dBuV/m.
 Then Correct Factor = $30.20 + 2.00 - 32.00 = 0.20\text{dB/m}$;
 Corrected Reading = $10\text{dBuV} + 0.20\text{dB/m} = 10.20\text{dBuV/m}$;
 Margin = $40.00\text{dBuV/m} - 10.20\text{dBuV/m} = 29.80\text{dB}$.

Duty Cycle:

The test data with maximum duty cycle was listed below.

The worst Duty cycle = $0.72 / 6.93 = 0.104$



Calculating the AV value according to the duty cycle

Antenna	Frequency (MHz)	PK Reading (dBuV/m)	Correct Factor (dB)	AV Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	2452.00	78.16	-19.66	58.5	94.00	35.5
V	2452.00	78.33		58.67	94.00	35.33
H	2463.00	80.35		60.69	94.00	33.31
V	2463.00	80.53		60.87	94.00	33.13
H	2474.00	79.04		59.38	94.00	34.62
V	2474.00	80.31		60.65	94.00	33.35

Remark:

- Correct Factor = $20\lg(\text{duty cycle}) = 20\lg(0.72 / 6.93) = -19.66$;
- AV Reading = PK Reading + Correct Factor;

3. Margin = limit - AV Reading.

4 Power line conducted emission

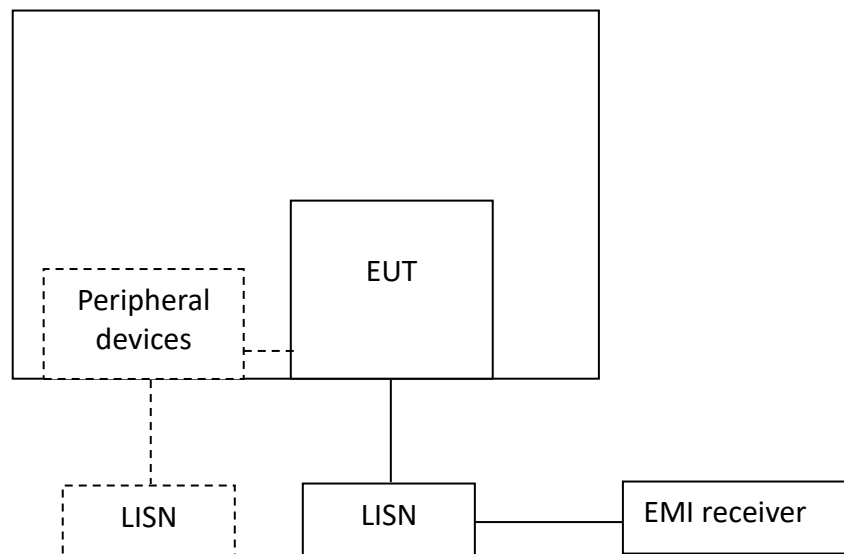
Test result: Not applicable.

4.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

4.2 Test Configuration



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Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

4.4 Test Results of Power line conducted emission

Not applicable.

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5 Assigned bandwidth (20dB bandwidth)

Test result: Pass

5.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission is contained within the allocated frequency band.

5.2 Measurement Procedure

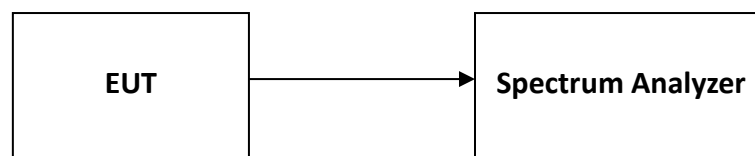
The 20dB Bandwidth is measured using the Spectrum Analyzer.

Set Span = 2 to 3 times the 20 dB bandwidth, $RBW \geq 1\%$ of the 20 dB bandwidth, $VBW > RBW$,

Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at 3 channels (lowest, middle and highest channel).

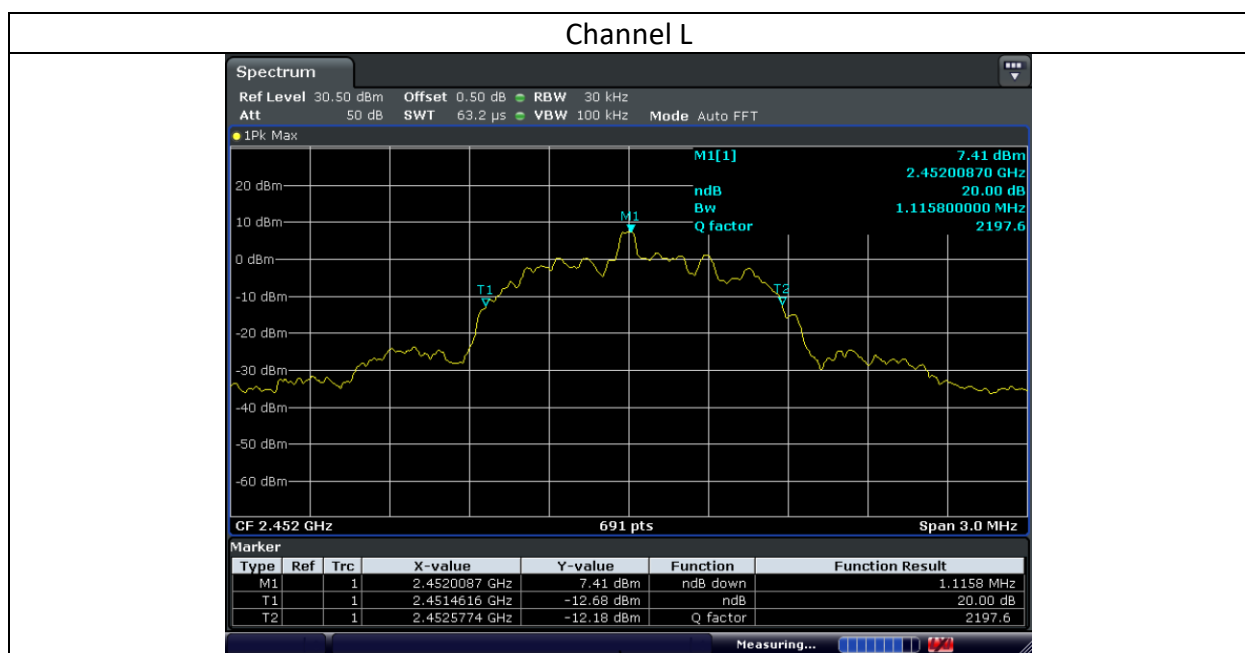
5.3 Test Configuration



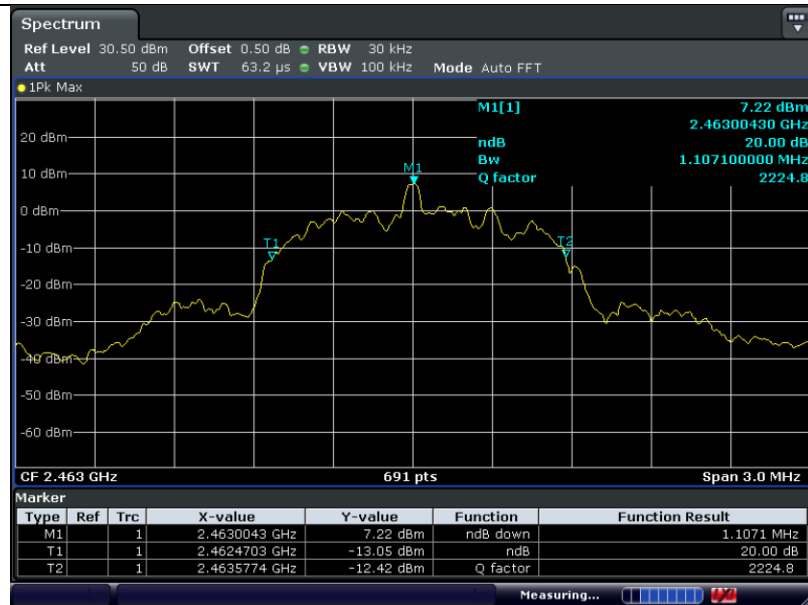
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5.4 The results

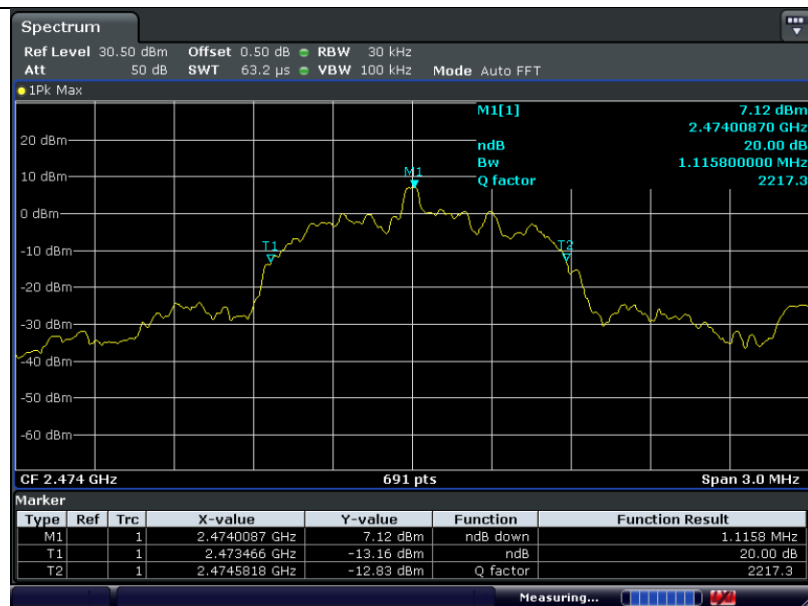
Test Mode	Frequency (MHz)	20dB Bandwidth (MHz)		F _L at 20dB BW (MHz)	F _H at 20dB BW (MHz)
TX	2452	1.116		2451.462	/
	2463	1.107		/	/
	2474	1.116		/	2474.582
Limit		N/A	N/A	F _L > 2400	F _H < 2483.5
Result		Complied			



Channel M



Channel H



6 Antenna requirement

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.

Result:

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

Appendix I: Photograph of test setup

Refer to Appendix for Photograph of test setup

Appendix II: Photograph of equipment under test

Refer to Appendix for EUT external and internal photographs.

***** END *****