FCC - TEST REPORT

Report Number	:	**68.960.14.028.01**	Date of Issue:	13 November 2014

Model	:	TPR311, TPR309, TPR310, TPR312, MAV230
Product Type	:	BLE Bluetooth BBQ Thermometer With LCD and LED display Four sensors channel
Applicant	:	Ewig Industries Macao Commercial offshore Limited
Address	:	Rue De Pequim Macau Finance Centre 14E, Macau.
Manufacturer	:	DongGuan Q & S Manufacturing Co. Ltd
Address	:	Yin Shan Industrial District, Fu Gang Village, Xiang Mang West Road, Qing Xi Town, Dongguan City, Guang Dong Province, China
Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	25

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1 Table of Contents

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299

Test Site 2

Company name:	Global United Technology Services Co., Ltd. 1st Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China
FCC Registration Number:	600491
Telephone:	86 755 2779 8480
Fax:	86 755 2779 8960

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	BLE Bluetooth BBQ Thermometer With LCD and LED display Four Sensors channel
Model no.:	TPR311, TPR309, TPR310, TPR312, MAV230
FCC ID:	N9ZTPR311
Rating:	DC 3.0V (2*AAA Battery)
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Duty Cycle:	NIL
Antenna Type:	Integral Antenna
Antenna Gain:	-1.5dBi
Description of the EUT:	The Equipment Under Test (EUT) is a BBQ Thermometer with Bluetooth 4.0 function operating at 2.4GHz

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2012 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000 and C63.10 (2009).

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5 Summary of Test Results

Technical Requirements				
FCC Part 15 Subpart C				
Test Condition		Pages	Test Site	Test Result
§15.207	Conducted emission AC power port	---	---	N/A
§15.247(b)(1)	Conducted peak output power	13	Site 2	Pass
§15.247(a)(1)	6dB bandwidth	14	Site 2	Pass
§15.247(a)(1)	Carrier frequency separation	---	---	N/A
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	N/A
§15.247(a)(1)(iii)	Dwell Time	---	---	N/A
§15.247(e)	Power spectral density*	18	Site 2	Pass
§15.247(d)	Spurious RF conducted emissions	19	Site 2	Pass
§15.247(d)	Band edge	23	Site 2	Pass
§15.247(d) & §15.209 &	Spurious radiated emissions for transmitter and receiver	25	Site 2	Pass
§15.203	Antenna requirement	See note 1		Pass

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a permanently ceramic antenna, which gain is -1.5dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: N9ZTPR311 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: October 9, 2014

Testing Start Date: October 24, 2014

Testing End Date: November 13, 2014

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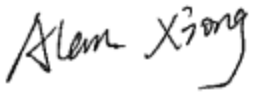
Reviewed by:

John Zhi
EMC Project Manager

Prepared by:



Alan Xiong
EMC Project Engineer

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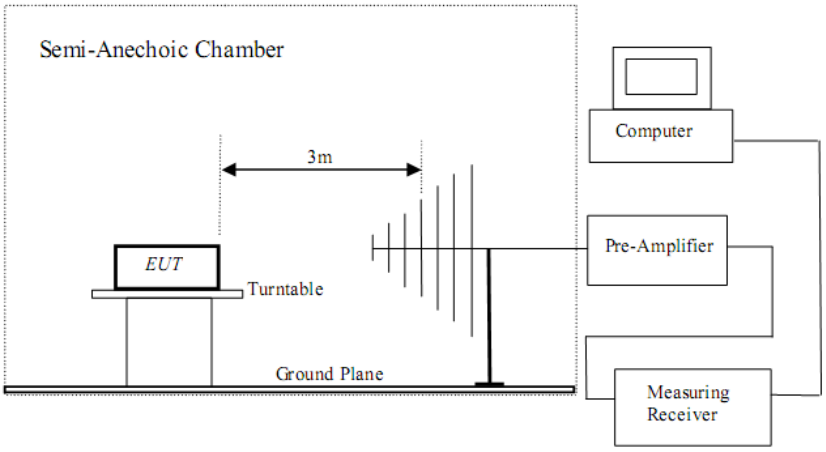
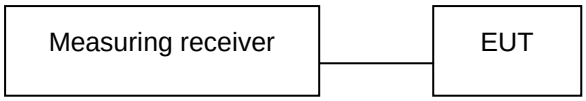
7 Test Setups

7.1 Radiated test setups



7.2 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenovo	X220	NIL

The system was configured to channel 0, 19, and 39 for the test.

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9 Technical Requirement

9.1 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
   RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW
   Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Limits

According to §15.247 (b) (1), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2402-2480	≤1	≤30

Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	3.38	Pass
Middle channel 2440MHz	3.09	Pass
High channel 2480MHz	3.31	Pass

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9.2 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

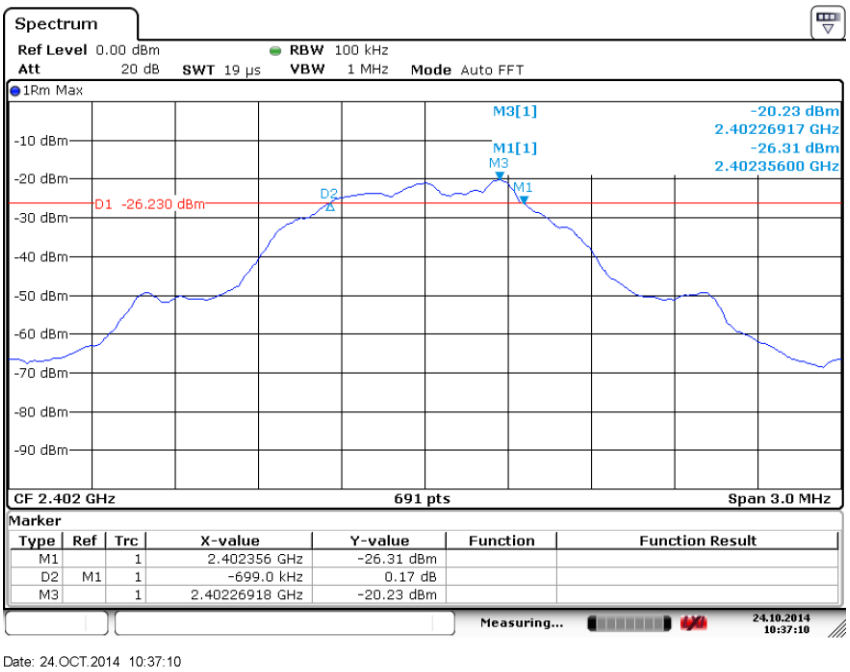
Limit

Limit [kHz]
≥500

Test result

Frequency MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2402	699	--	--	Pass
2440	677.3	--	--	Pass
2480	703.3	--	--	Pass

2402MHz-6dB bandwith



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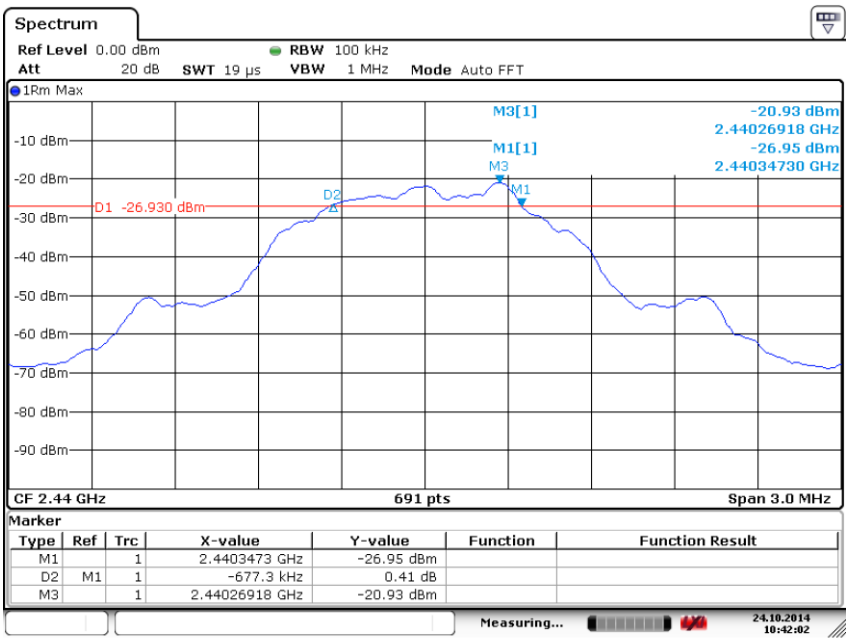
2440MHz-6dB bandwith



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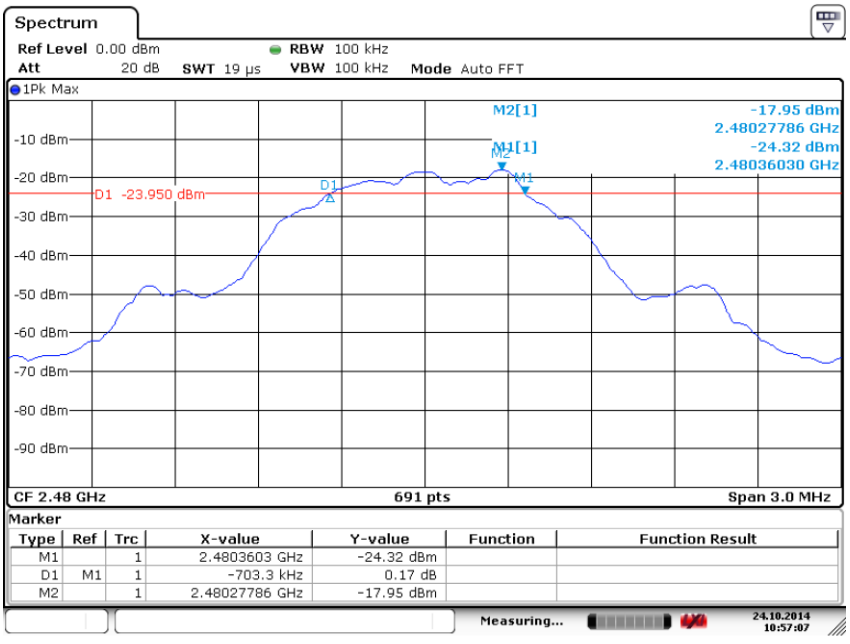
2480MHz-6dB bandwith



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9.3 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]
≤8

Test result

Frequency **MHz**	Power spectral density **dBm**	Result
Low channel 2402MHz	-10.39	Pass
Middle channel 2440MHz	-10.72	Pass
High channel 2480MHz	-10.81	Pass

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9.4 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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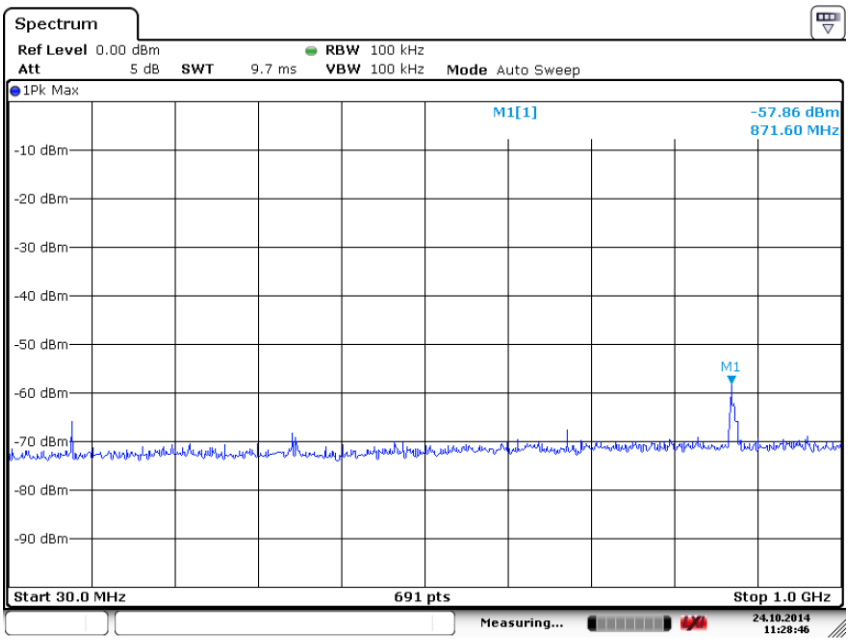
Spurious RF conducted emissions

2402MHz



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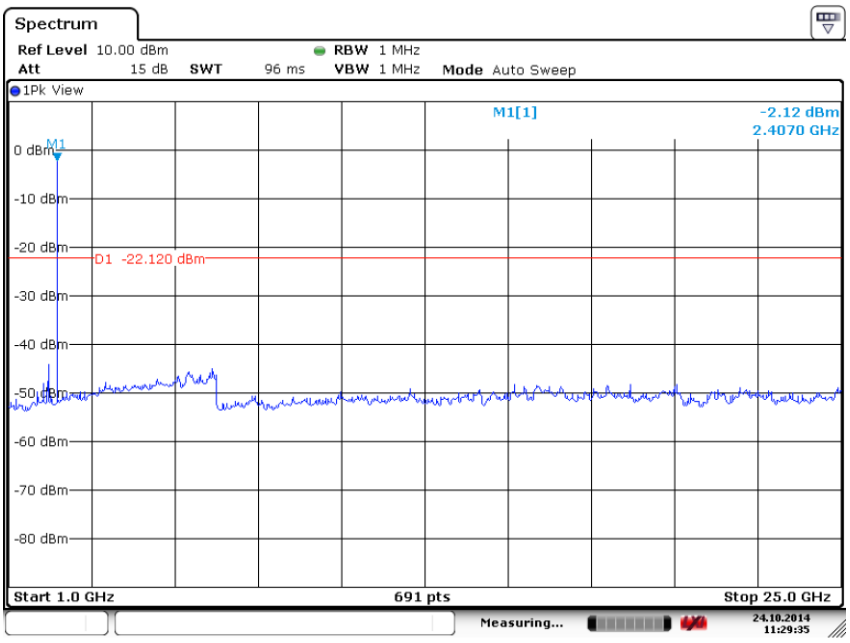

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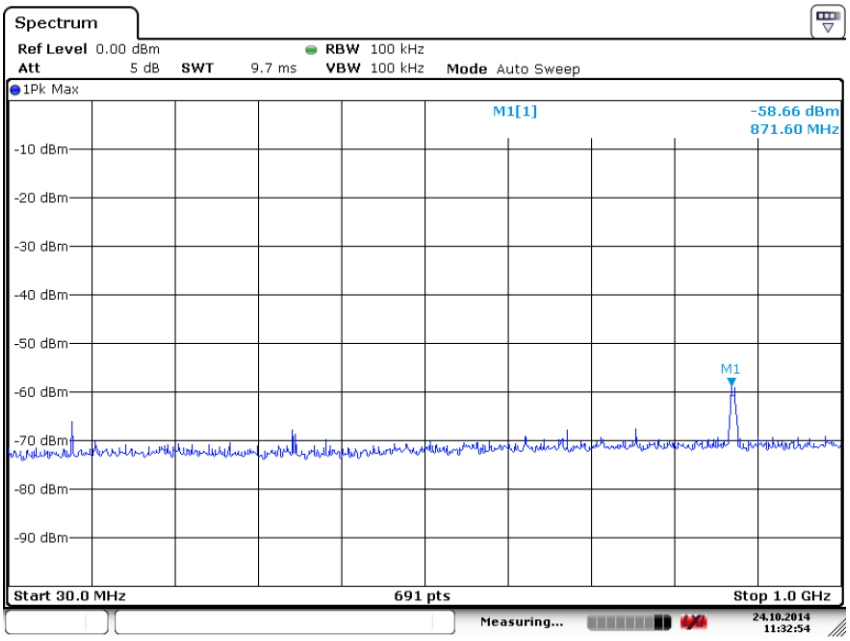
2440MHz



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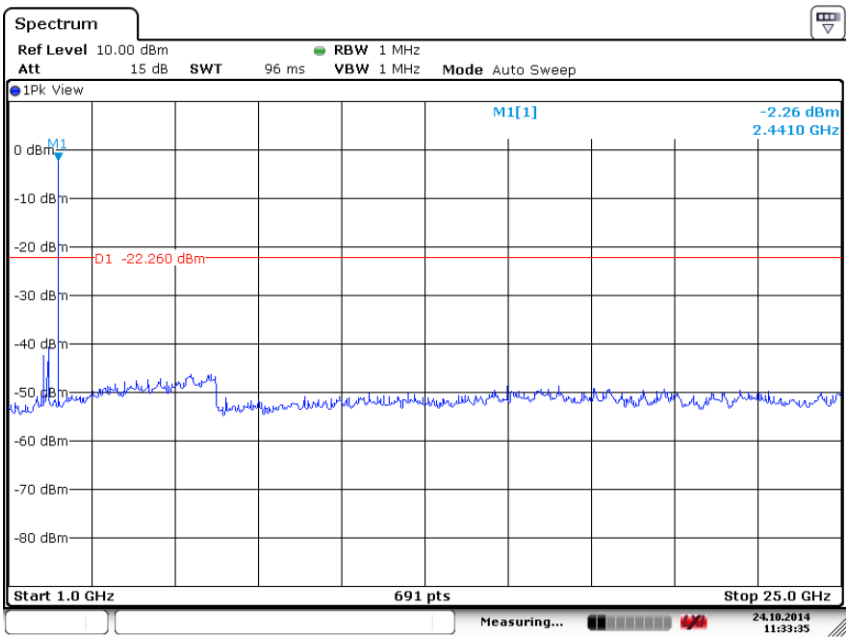

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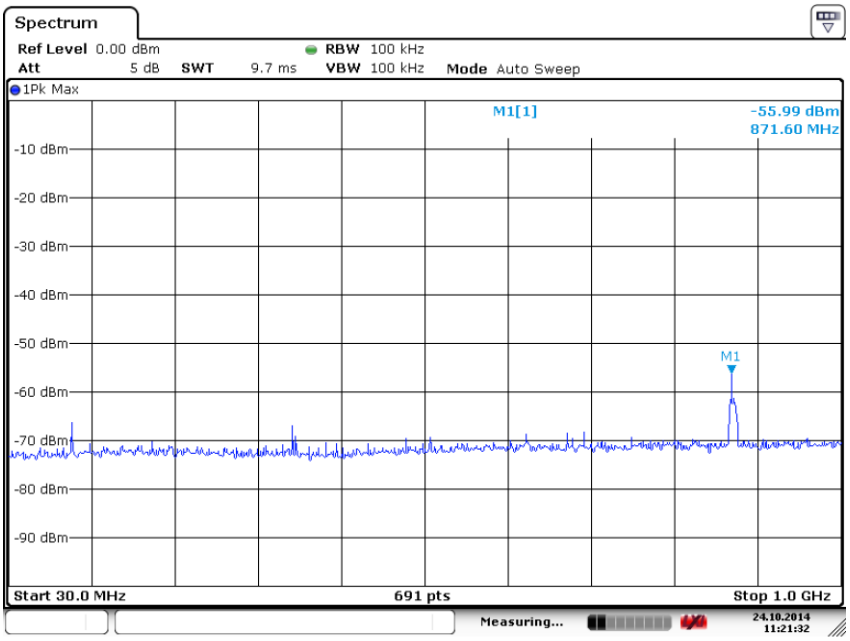
2480MHz



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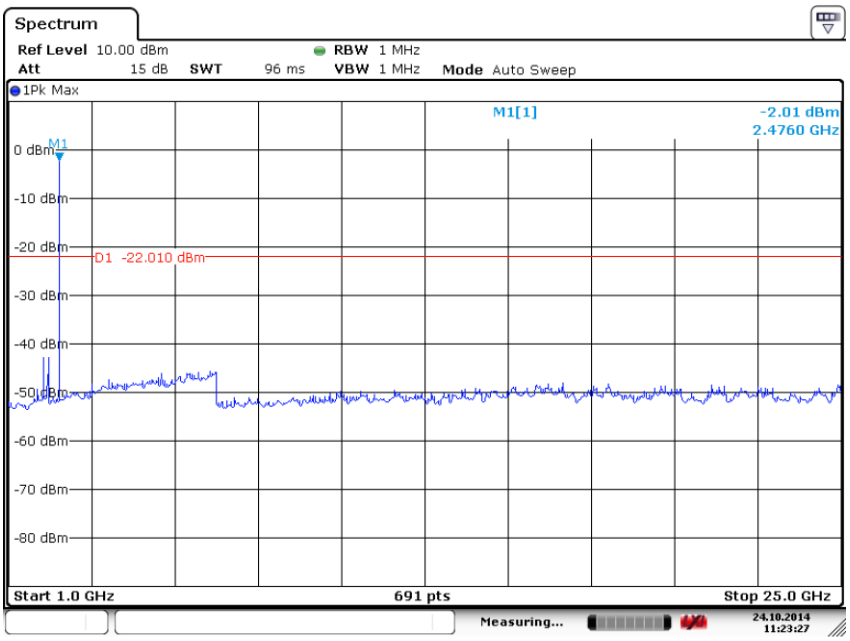

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9.5 Band edge

Test Method

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold.

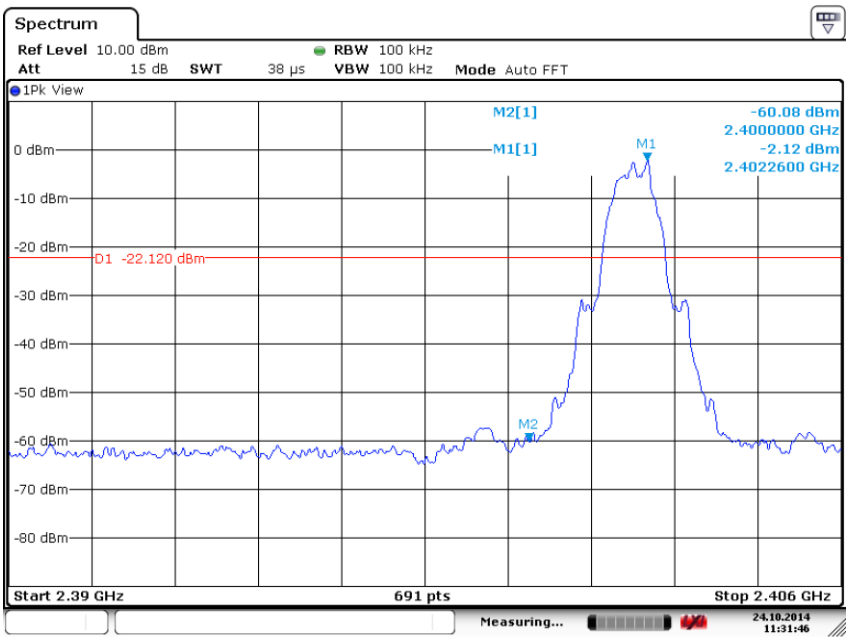
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.

3 The level displayed must comply with the limit specified in this Section.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result



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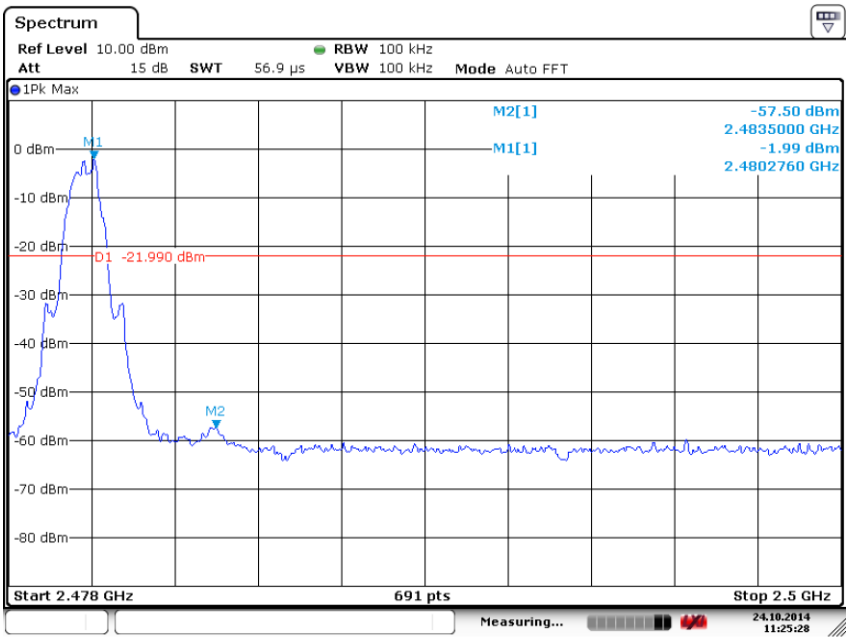

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9.6 Spurious radiated emissions for transmitter and receiver

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
   The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength,submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

According to part 15.247(d), the radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

2402MHz

Frequency	Reading	Correct	Emission Level	Polarization	Limit	Detector	Result
MHz	dBuV	dB/m	dBuV/m		dBµV/m		
170.6500	40.25	-14.76	25.49	Horizontal	43.5	QP	Pass
232.7300	42.47	-12.33	30.14	Horizontal	46	QP	Pass
79.4699	41.81	-19.12	22.69	Vertical	40	QP	Pass
358.8299	36.84	-11.14	25.70	Vertical	46	QP	Pass
*4804	45.28	14.63	59.91	Horizontal	74	PK	Pass
*4804	36.10	14.63	50.73	Horizontal	54	AV	Pass
*7206	38.15	20.68	58.83	Horizontal	74	PK	Pass
*7206	25.70	20.68	46.38	Horizontal	54	AV	Pass
*4804	37.03	14.63	51.66	Vertical	74	PK	Pass
*4804	23.58	14.63	38.21	Vertical	54	AV	Pass
*7206	38.77	20.68	59.45	Vertical	74	PK	Pass
*7206	25.83	20.68	46.51	Vertical	54	AV	Pass

2440MHz

Frequency	Reading	Correct	Emission Level	Polarization	Limit	Detector	Result
MHz	dBuV	dB/m	dBuV/m		dBµV/m		
*4880	46.92	14.96	61.88	Horizontal	74	PK	Pass
*4880	35.99	14.96	50.95	Horizontal	54	AV	Pass
*7320	38.99	20.91	59.90	Horizontal	74	PK	Pass
*7320	25.77	20.91	46.68	Horizontal	54	AV	Pass
*4880	37.84	14.96	52.80	Vertical	74	PK	Pass
*4880	23.69	14.96	38.65	Vertical	54	AV	Pass
*7320	37.05	20.91	57.96	Vertical	74	PK	Pass
*7320	26.60	20.91	47.51	Vertical	54	AV	Pass

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2480MHz

Frequency	Reading	Correct	Emission Level	Polarization	Limit	Detector	Result
MHz	dBuV	dB/m	dBuV/m		dBµV/m		
*4960	42.26	15.30	57.56	Horizontal	74	PK	Pass
*4960	33.05	15.30	48.35	Horizontal	54	AV	Pass
*7440	38.67	21.16	59.83	Horizontal	74	PK	Pass
*7440	26.07	21.16	47.23	Horizontal	54	AV	Pass
*4960	37.37	15.30	52.67	Vertical	74	PK	Pass
*4960	24.20	15.30	39.50	Vertical	54	AV	Pass
*7440	37.79	21.16	58.95	Vertical	74	PK	Pass
*7440	25.57	21.16	46.73	Vertical	54	AV	Pass

Remark:

(1) QP Emission Level= Antenna Factor +Cable Loss + Reading

PK Emission Level= Antenna Factor +Cable Loss - Amp. Factor + Reading

AV Emission Level= PK Emission Level+20log (dutycycle)

(2) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

(3) Testing is carried out with frequency rang 9kHz to the 10th harmonics, which above 3th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz.

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Receiving emission test result as below:

Frequency	Reading	Correct	Emission Level	Polarization	Limit	Detector	Result
MHz	dBuV	dB/m	dBuV/m		dBµV/m		
146.4000	40.26	-15.58	24.68	Horizontal	43.5	QP	Pass
356.8900	36.39	-9.12	27.26	Horizontal	46	QP	Pass
170.6500	39.57	-17.76	21.81	Vertical	43.5	QP	Pass
349.1298	34.91	-11.13	23.78	Vertical	46	QP	Pass

Remark:

(1) QP Emission Level= Antenna Factor +Cable Loss + Reading
PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading
AV Emission Level= PK Emission Level+20log (dutycycle)

(2) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section RSS-Gen.

(3) Testing is carried out with frequency rang 9kHz to the 10th harmonics, which above 1GHz are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz.

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10 Test Equipment List

List of Test Instruments

ESCRIPTION	MANUFACTURER	MODEL NO.	CAL. DUE DATE
3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	Mar. 28 2015
Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	N/A
EMI Test Receiver	Rohde & Schwarz	ESU26	June 30 2015
BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	Feb. 22 2015
Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	June 26 2015
Horn Antenna	ETS-LINDGREN	3160	Mar. 27 2015
EMI Test Software	AUDIX	E3	N/A
Amplifier(100kHz-3GHz)	HP	8347A	June 30 2015
Amplifier(2GHz-20GHz)	HP	8349B	June 30 2015
Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	June 26 2015
Band filter	Amindeon	82346	Mar. 28 2015
Constant temperature and humidity box	Oregon Scientific	BA-888	May 09 2015
Signal Analyzer	Agilent	N9010A	Jan. 19 2015

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

Items	Extended Uncertainty
Radiation emission	U=3.42dB (30MHz-1GHz) U=4.58dB (1GHz-18GHz)
Output power test	0.94 dB
Power density test	2.10 dB
Bandwidth	1x10-9

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