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TCT通测检测 TESTING CENTRE TECHNOLOGY

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1. Test Certification

Product:	Wireless Keyboard		
Model No.:	ET-8103	(\mathcal{S})	.c
Additional Model:	ET-K010, K010, ET-3750		Ũ
Applicant:	Eastern Times Technology Co., Itd	(c	
Address:	Building D, Nan An Industry Area, Youganpu Dongguan City, Guangdong, China.	Village, Fengga	ang Town,
Manufacturer:	Eastern Times Technology Co., Itd	(c^{*})	(c
Address:	Building D, Nan An Industry Area, Youganpu Dongguan City, Guangdong, China.	Village, Fengga	ang Town,
Date of Test:	July 01- July 09, 2015		Š)
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section	15.249	/

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:	Net were	Date:	July 09, 2015	
Reviewed By:	Neil Wong	Date:	July 10, 2015	
Approved By:	Davis Zhou TomSm	Date:	July 10, 2015	S
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2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	N/A
Field Strength of Fundamental	§15.249 (a)	PASS
Spurious Emissions	§15.249 (a) (d)/ §15.209	PASS
Band Edge	§15.249 (d)/ §15.205	PASS
20dB Occupied Bandwidth	§15.215 (c)	PASS

Note:

1. Pass: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

3. N/A: Test case does not apply to the test object.

4. The test result judgment is decided by the limit of test standard.

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3. EUT Description

Product Name:	Wireless Keyboard
Model :	ET-8103
Additional Model:	ET-K010, K010, ET-3750
Trade Mark:	N/A
Operation Frequency:	2408-2474MHz
Channel Separation:	2MHz
Number of Channel:	34
Modulation Technology:	FSK
Antenna Type:	Internal Antenna
Antenna Gain:	-2.0dBi
Power Supply:	DC 3.0V(AAA Battery * 2)
Remark:	All models above are identical in interior structure, electrical circuits and components, and just differ in look and model for the marketing requirement.

Operation Frequency Each of Channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2408MHz	10	2428 MHz	20	2448 MHz	30	2468 MHz
c 1	2410 MHz	11	2430 MHz	21	2450 MHz	31	2470 MHz
2	2412 MHz	12	2432 MHz	22	2452 MHz	32	2472 MHz
3	2414 MHz	13	2434 MHz	23	2454 MHz	33	2474 MHz
4	2416 MHz	14	2436 MHz	24	2456 MHz		
5	2418 MHz	15	2438 MHz	25	2458 MHz		KC)
6	2420 MHz	16	2440 MHz	26	2460 MHz		
7	2422 MHz	17	2442 MHz	27	2462 MHz		
6 8	2424 MHz	18	2444 MHz	28	2464 MHz	G)	(20)
9	2426 MHz	19	2446 MHz	29	2466 MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2408MHz
The middle channel	2440MHz
The Highest channel	2474MHz

4. Genera Information

4.1. Test Environment and Mode

Operating Environment:			
Temperature:	25.0 °C		
Humidity:	54 % RH	(3)	
Atmospheric Pressure:	1010 mbar		
Test Mode:			

Engineering mode:	Keep the EUT in continuous transmitting by select channel

The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

4.2. Description of Support Units

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

Equipment	Model No.	Serial No.	FCC ID	Trade Name
1				

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5. Facilities and Accreditations

5.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

• FCC - Registration No.: 572331

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

• IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

• CNAS - Registration No.: CNAS L6165

Shenzhen TCT Testing Technology Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6165.

5.2. Location

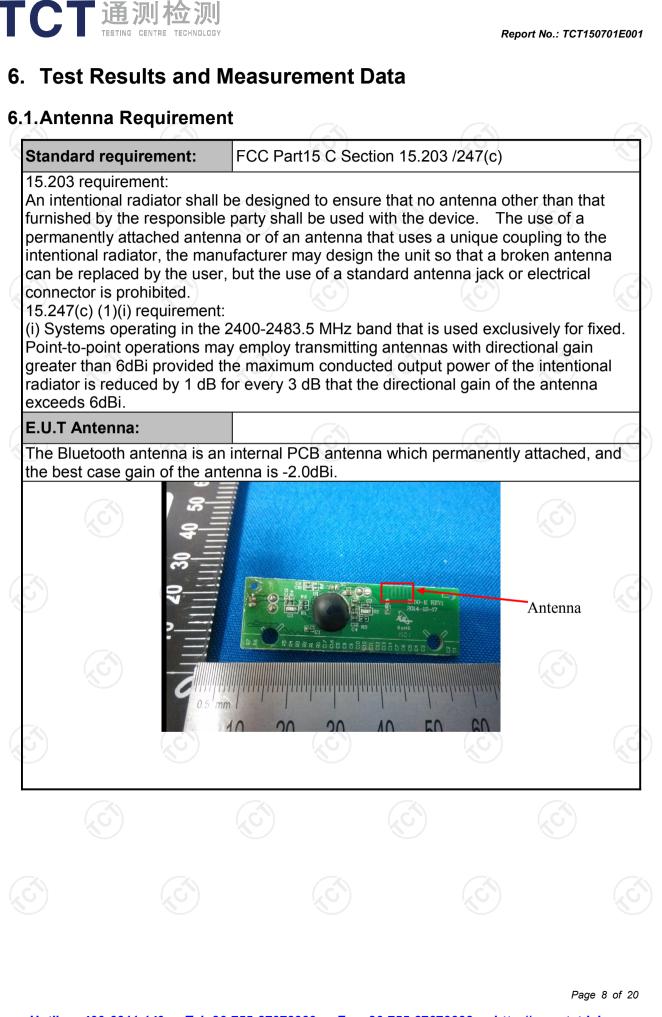
Shenzhen Tongce Testing Lab

Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China Tel: 86-755-36638142

5.3. Measurement Uncertainty

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

No.	Item	MU
1	Conducted Emission	±2.56dB
2	RF power, conducted	±0.12dB
3	Spurious emissions, conducted	±0.11dB
4	All emissions, radiated(<1GHz)	±3.92dB
5	All emissions, radiated(>1GHz)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%



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6.2.Conducted Emission

Test Requirement:	FCC Part15 C Section	15.207				
Test Method:	ANSI C63.4:2009	ANSI C63.4:2009				
Frequency Range:	150 kHz to 30 MHz	(C)	(c^{*})			
Receiver setup:	RBW=9 kHz, VBW=30	kHz, Sweep time	=auto			
	Frequency range	Limit (dBuV)			
	(MHz)	Quasi-peak	Average			
Limits:	0.15-0.5	66 to 56*	56 to 46* 📎			
Linito.	0.5-5	56	46			
	5-30	60	50			
	Refere	ence Plane				
Test Setup:	AUX Equipment E. Test table/Insulation pla Remarkc E.U.T: Equipment Under Test LISN: Line Impedence Stabilizatio Test table height=0.8m	U.T ane	ter — AC power			
Test Mode:	Transmitting mode with	h modulation				
Test Procedure:	 The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2009 on conducted measurement. 					

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6.3. Radiated Emission Measurement

6.3.1. Test Specification

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Test Requirement:	FCC Part15	C Section	า 15.209				
Test Method:	ANSI C63.4	: 2009 and	d ANSI C	63.10:20	09		
Frequency Range:	9 kHz to 25	GHz					
Measurement Distance:	3 m	X	9		NO N		
Antenna Polarization:	Horizontal &	& Vertical					
	Frequency	Detector	RBW	VBW	Remark		
	9kHz- 150kHz		200Hz	1kHz	Quasi-peak Value		
De seisen Ostene	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value		
Receiver Setup:	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value		
		Peak	1MHz	3MHz	Peak Value		
	Above 1GHz	Peak	1MHz	10Hz	Average Value		
	Freque	ency	Limit (dBu)	//m @3m)	Remark		
Limit(Field strength of the	(94.		Average Value		
fundamental signal):	2400MHz-24	183.5MHz	114.00		Peak Value		
	Freque	Limit (dBuV/m @3m)		Remark			
	0.009-0		2400/F(KHz)		Quasi-peak Value		
	0.490-1.705		24000/F(KHz)		Quasi-peak Value		
	1.705	-30	30		Quasi-peak Value		
Limit(Spurious Emissions):	30MHz-8	88MHz	40	.0	Quasi-peak Value		
	88MHz-2	16MHz	43	.5	Quasi-peak Value		
	216MHz-9	60MHz	46.0		Quasi-peak Value		
	960MHz-	-1GHz	54.0		Quasi-peak Value		
	Above 2	IGHz	54 74		Average Value Peak Value		
Limit (band edge) :	bands, exce least 50 dB general rac	ept for har below the diated em	utside of monics, s level of t ission lir	the spe shall be a he funda nits in S	cified frequency attenuated by a amental or to the		
Test Procedure:	 general radiated emission limits in Section 15.20 whichever is the lesser attenuation. 1. The EUT was placed on the top of a rotating table 0 meters above the ground at a 3 meter camber below 1GHz, 80cm above the ground in above 1GHz. The table was rotated 360 degrees determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounter on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to for meters above the ground to determine the maximu value of the field strength. Both horizontal ar vertical polarizations of the antenna are set to make the ground to determine the maximu value of the field strength. 						

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	 the measurement. 4. 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. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
	For radiated emissions below 30MHz
Test setup:	30MHz to 1GHz
S S	Ground Plane Above 1GHz
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 Image: Description of the provided integration of the

6.3.2. Test Instruments

3.2. Test instrument	5				
ESPI Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Sept.16 , 2015	
Spectrum Analyzer	ROHDE&SCHW ARZ	FSEM	848597/001	Sept.16 , 2015	
Spectrum Analyzer	Agilent	N9020A	MY49100060	Oct. 21, 2015	
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sept.16 , 2015	
Pre-amplifier	HP	8447D	2727A05017	Sept.16 , 2015	
Loop antenna	ZHINAN	ZN30900A	12024	Dec.14 , 2015	
Broadband Antenna	Schwarzbeck	VULB9163	340	Sept.16 , 2015	
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sept.16 , 2015	
Horn Antenna	Schwarzbeck	BBHA 9170	373	Sept.16 , 2015	
Coax cable	ТСТ	RE-low-01	N/A	Sept.15 , 2015	
Coax cable	тст	RE-high-02	N/A	Sept.15 , 2015	
Coax cable	тст	RE-low-03	N/A	Sept.15 , 2015	
Coax cable	тст	RE-high-04	N/A	Sept.15 , 2015	
Antenna Mast	CCS	CC-A-4M	N/A	N/A	
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A	

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

Field Strength of Fundamental

Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal /Vertical	Limits PK/AV (dBuV/m)	Margin (dB)
2408	65.26(PK)	Н	114/94	-28.74
2440	68.41(PK)	V	114/94	-25.59
2474	69.05(PK)	V	114/94	-24.95
Š) (6)	(Ú)	Ó	<u> </u>

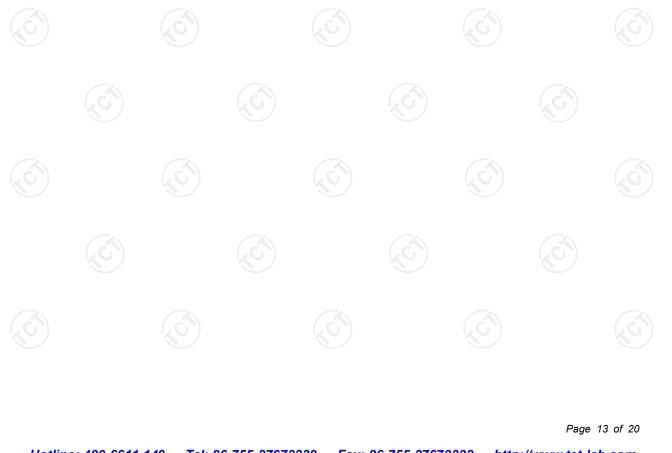
Spurious Emissions

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)
		(d) - (d)
<u> </u>	<u> </u>	

Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

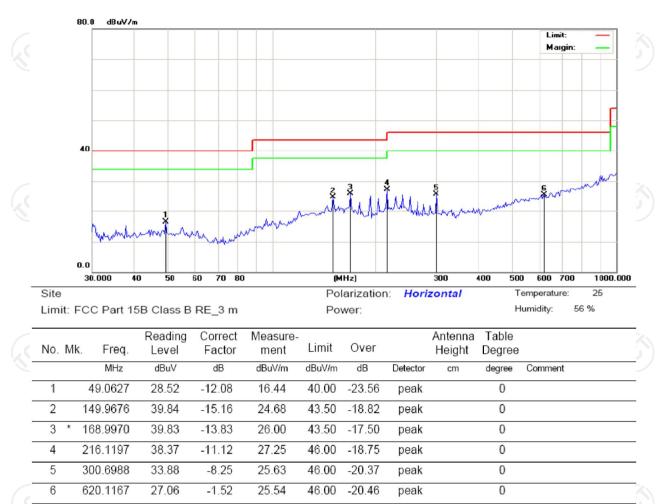
2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement



Frequency Range (30MHz-1GHz)

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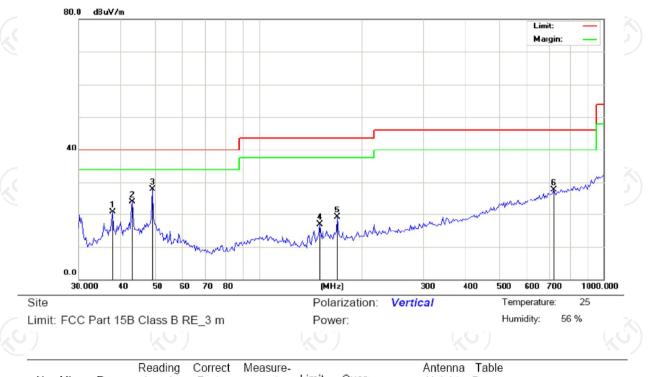
Horizontal:





Vertical:

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	No.	Mk.	Freq.	Level	Factor	ment	Limit	Over		Height			
-			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment	
-	1		37.5647	33.45	-12.78	20.67	40.00	-19.33	peak		0		
-	2		42.9305	36.18	-12.34	23.84	40.00	-16.16	peak		0		
_	3	*	49.0626	39.97	-12.08	27.89	40.00	-12.11	peak		0		
ć	4	ŕ	149.9676	32.07	-15.16	16.91	43.50	-26.59	peak		0		
	5	,	168.9970	32.88	-13.83	19.05	43.50	-24.45	peak		0		
-	6	7	718.7246	27.25	0.37	27.62	46.00	-18.38	peak		0		

Note: Measurements were conducted in all channels (high, middle, low), and the worst case (low channel) was submitted only.

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				7 10 0 1 0					
				_ow channe	l: 2408 MF	lz			
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBuV)	Correction Factor (dB/m)	Emissic Peak (dBµV/m)	n Level AV (dBµV/m)	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
2387.50	Н	69.32		-4.20	65.12		74.00	54.00	-8.88
2387.50	Н		48.24	-4.20	2	44.04	74.00	54.00	-9.96
4816.00	Н	47.04		-3.94	43.10		74.00	54.00	-30.90
7224.00	Н	44.71		0.52	45.23		74.00	54.00	-28.77
	χG`)		5	~)	Ģ	(GT)			
2387.50	Ś	66.94		-4.20	62.74		74.00	54.00	-11.26
2387.50	V		51.99	-4.20		47.79	74.00	54.00	-6.21
4816.00	V	48.18		-3.94	44.24		74.00	54.00	-29.76
7224.00	V	44.37		0.52	44.89		74.00	54.00	-29.11
2				2	· /				

Above 1GHz

			Ν	liddle chanr	el: 2440M	Hz			
Frequency (MHz)	Ant. Pol. H/V	Peak reading	AV reading	Correction Factor		on Level AV	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
4000.00		(dBµV)	(dBµV)	(dB/m)		(αθμν/ጠ)	74.00	54.00	00.40
4880.00	Н	48.79		-3.98	44.81		74.00	54.00	-29.19
7320.00	Н	46.14		0.57	46.71		74.00	54.00	-27.29
		-		(×		-		
<u> </u>		()		(, (5)				
					/				
4880.00	V	48.82		-3.98	44.84		74.00	54.00	-29.16
	v								
7320.00	V	47.35		0.57	47.92		74.00	54.00	-26.08
			-40)		C			
	<u> </u>					<u> </u>			

			ł	High channe	el: 2474 Mł	Ηz			
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBµV)	Correction Factor (dB/m)	Emissic Peak (dBµV/m)	n Level AV (dBµV/m)	Peak limit (dBuV/m)	AV limit (dBµV/m)	Margin (dB)
2486.58	Н	67.20		-2.38	64.82		74.00	54.00	-9.18
2486.58	H		47.98	-2.38		45.60	74.00	54.00	-8.40
4948.00	K H	50.98		-3.98	47.00	<u> </u>	74.00	54.00	-27.00
7422.00	Н	46.31		0.57	46.88		74.00	54.00	-27.12
~		(A)		_	X \		(A)		\cap
2483.51	V	67.53		-2.38	65.93		74.00	54.00	-8.07
2483.51	V		48.18	-2.38) <u></u>	45.80	74.00	54.00	-6.93
4948.00	V	50.94		-3.98	46.37		74.00	54.00	-27.63
7422.00	V	46.27		0.57	45.85		74.00	54.00	-28.15
				<u> </u>					
Vote:	XU)		N N					KO)	

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

2. Margin (dB) = Emission Level (Peak) ($dB\mu V/m$)-Average limit ($dB\mu V/m$)

3. The emission levels of other frequencies are very lower than the limit and not show in test report.

4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

5. Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

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Band Edge Requirement

Low chann	el: 2408 M	1Hz							
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBµV)	AV reading (dBuV)	Correction Factor (dB/m)	Emissio Peak (dBµV/m)	AV	Peak limit (dBµV/m)	AV limit (dBµV/m)	Margin (dB)
2400	Н	68.77	/	-4.2	64.57		74		-9.43
2400	Н		48.79	-4.2	<u> </u>	44.59		54	-9.41
2400	V	68.60	(-4.2	64.40		74		-9.60
2400	V		52.08	-4.2		47.88		54	-6.12

Low channel: 2474MHz

Frequency	Ant Pol	Peak	AV	Correction			Peak limit	A\/ limit	Margin
(MHz)	H/V	reading (dBµV)	reading (dBuV)	Factor (dB/m)	Peak (dBµV/m)	AV (dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)
2483.5	H	70.51	/	-4.2	66.31		74		-7.69
2483.5			50.53	-4.2		46.33		54	-7.67
2483.5	V	68.57		-4.2	64.37		74		-9.63
2483.5	V	-	52.05	-4.2		47.85		54	-6.15
			/				× /		1

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

2. Margin (dB) = Emission Level (Peak) (dBµV/m)-Average limit (dBµV/m)

3. The emission levels of other frequencies are very lower than the limit and not show in test report.

4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

5. Data of measurement shown "----"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

6.4.20dB Occupied Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.215(c)
Test Method:	ANSI C63.4: 2009
Limit:	N/A
	 According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. Set to the maximum power setting and enable the EUT transmit continuously. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dE bandwidth, centered on a hopping channel; RBW≥1% of the 20 dB bandwidth; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold. Measure and record the results in the test report.
Test setup:	Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test results:	PASS

6.4.2. Test Instruments

	RF Test Room					
2	Equipment	Manufacturer	Model	Serial Number	Calibration Due	
	Spectrum Analyzer	Agilent	N9020A	MY49100060	Oct. 21, 2015	

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



6.4.3. Test data

	Test Channel	20dB Occupy Bandwidth (kHz)	Limit	Conclusion	
3	Lowest	246.7		PASS	
	Middle	246.3		PASS	
	Highest	241.5		PASS	
_					

Test plots as follows:

	ots as follow	ws:						
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Lowest channel



Middle channel



Highest channel



*****END OF REPORT*****

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