

FCC/IC - TEST REPORT



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1 Table of Contents

1	Tal	ble of Contents	2		
2	Details about the Test Laboratory				
3	De	scription of the Equipment Under Test	4		
4	Su	mmary of Test Standards	5		
5	Su	mmary of Test Results	6		
6	Ge	neral Remarks	7		
7	Tes	st Setups	8		
8	Sys	stems test configuration	9		
9	Те	chnical Requirement 1	10		
9	.1	Conducted Emission 1	10		
9	.2	Conducted peak output power1	13		
9	.3	20 dB bandwidth and 99% Occupied Bandwidth 1	15		
9	.4	Carrier Frequency Separation2	25		
9	.5	Number of hopping frequencies2	27		
9	.6	Dwell Time	29		
9	.7	Spurious RF conducted emissions	32		
9	.8	Band edge testing	36		
9	.9	Spurious radiated emissions for transmitter and receiver	11		
10	Tes	st Equipment List	13		
11	System Measurement Uncertainty 44				

China

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
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Test Site 2 Company name:	Audix Technology (shenzhen) Co.,Ltd No. 6, Ke Feng Rd, 52 Block Shenzhen Science and Industry Park, Nantou, Shenzhen, Guangdong, China
Telephone:	86 755 2663 9496
Fax:	86 755 2663 2877



3 Description of the Equipment Under Test

Product:	MP10QCFSG Module
Model no.:	363005
FCC ID:	OMC363005
IC ID:	3673A-363005
Options and accessories:	NIL
Rating:	DC 12V Powered by external power supply: Adaptor Input: 100-240VAC, 50/60Hz Adaptor Output: 12VDC, 2.0A
RF Transmission	2402-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8DPSK
Duty Cycle:	11.5%
Antenna Type:	Embedded Type Antenna
Antenna Gain:	1dBi
Description of the EUT:	The Equipment Under Test (EUT) is a MP10QCFSG Module operated at 2.4GHz



Test Standards				
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES			
10-1-2014 Edition	Subpart C - Intentional Radiators			
RSS-Gen Issue 4	General Requirements for the Certification of Radio Apparatus			
November 2014				
RSS-210 Issue 8	RSS-210 — Licence-exempt Radio Apparatus (All Frequency			
December 2010	Bands): Category I Equipment			

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 (2013).

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5 Summary of Test Results

Technical Requirements							
FCC Part 15 Subpart C, RSS-Gen, RSS-210							
Test Condition Pages Test Site Test Resul							
§15.207	RSS-GEN A8.8	Conducted emission AC power port	10	Site 2	Pass		
§15.247(b)(1)	RSS-210 A8.4	Conducted peak output power	13	Site 2	Pass		
§15.247(a)(2)	RSS-210 A8.2(a)	6dB bandwidth			N/A		
§15.247(a)(1)	RSS-210 A8.1(a) & RSSGEN 6.6	20dB bandwidth and 99% Occupied Bandwidth	15	Site 2	Pass		
§15.247(a)(1)	RSS-210 A8.1(b)	Carrier frequency separation	25	Site 2	Pass		
§15.247(a)(1)(iii)	RSS-210 A8.1(d)	Number of hopping frequencies	27	Site 2	Pass		
§15.247(a)(1)(iii)	RSS-210 A8.1(c)	Dwell Time	29	Site 2	Pass		
§15.247(e)	RSS-210 A8.2(b)	Power spectral density*			N/A		
§15.247(d)	RSS-210 A8.5	Spurious RF conducted emissions	32	Site 2	Pass		
§15.247(d)	RSS-210 A8.5	Band edge	36	Site 2	Pass		
§15.247(d) & §15.209 &	RSS-210 2.5 & RSSGEN 6.13	Spurious radiated emissions for transmitter and receiver	41	Site 2	Pass		
§15.203	RSSGEN 8.3	Antenna requirement	See	note 2	Pass		

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a Embedded Type antenna, which gain is 1dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: OMC363005, IC ID: 3673A-363005 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-210.

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:

November 5, 2014

Testing Start Date:

November 6, 2014

Testing End Date:

December 11, 2014

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Reviewed by:

Prepared by:

Tested by:

the

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Calvin Weng

Calvin Weng EMC Project Engineer

en Li

Leo Li EMC Test Engineer





7 Test Setups

7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 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)

Test software: USI_BCM_Testing_Tool, which used to control the EUT in continues transmitting mode

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power

9 Technical Requirement

9.1 Conducted Emission

Test Method

- 1. The EUT was placed on a table, which is 0.8m above ground plane
- 2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
- 3. Maximum procedure was performed to ensure EUT compliance
- 4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207 & RSS-GEN A7.2.4, conducted emissions limit as below:

	Frequency	QP Limit	AV Limit
	MHz	dBµV	dBµV
	0.150-0.500	66-56*	56-46*
	0.500-5	56	46
	5-30	60	50
р	• 1• 1 •		

Decreasing linearly with logarithm of the frequency





Conducted Emission

Product Type	:	MP10QCFSG Module
M/N	:	363005
Operating Condition	:	Transmitting
Test Specification	:	Line
Comment	:	AC 120V/60Hz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.153500		34.34	55.81	21.47	L1	9.6
0.153500	50.60		65.81	15.21	L1	9.6
0.197500		21.83	53.72	31.89	L1	9.8
0.197500	42.05		63.72	21.67	L1	9.8
0.326500		24.66	49.54	24.88	L1	10.2
0.326500	37.78		59.54	21.76	L1	10.2
1.037500		20.61	46.00	25.39	L1	9.8
1.037500	29.44		56.00	26.56	L1	9.8

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Conducted Emission

Product Type	:	MP10QCFSG Module
M/N	:	363005
Operating Condition	:	Transmitting
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.158000		36.54	55.57	19.03	Ν	9.6
0.158000	50.61		65.57	14.96	N	9.6
0.209500		33.71	53.23	19.52	Ν	9.8
0.209500	46.33		63.23	16.90	Ν	9.8
0.258500		31.29	51.48	20.19	Ν	10.0
0.258500	42.29		61.48	19.19	Ν	10.0
0.593500		24.23	46.00	21.77	Ν	10.0
0.593500	33.91		56.00	22.09	Ν	10.0

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Page 12 of 44

9.2 Conducted peak output power

Test Method

- Use the following spectrum analyzer settings: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured, VBW≥RBW, 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) and RSS-210 A8.4, conducted peak output power limit as below:

Frequency Range	Limit	Limit
MHz	W	dBm
2400-2483.5	≤1	≤30



Conducted peak output power

-

Bluetooth Mode GFS	K modulation Test	t Result
	Conducted Peak	
Frequency	Output Power	Result
MHz	dBm	
Low channel 2402MHz	-0.55	Pass
Middle channel 2441MHz	-2.60	Pass
High channel 2480MHz	0.30	Pass

.

Bluetooth Mode π/4-DQPSK modulation Test Result Conducted Peak

Frequency MHz	Output Power dBm	Result
Low channel 2402MHz	-0.95	Pass
Middle channel 2441MHz	-3.01	Pass
High channel 2480MHz	-0.14	Pass

Bluetooth Mode 8DPSK modulation Test Result **Conducted Peak**

Frequency MHz	Output Power dBm	Result
Low channel 2402MHz	-0.54	Pass
Middle channel 2441MHz	-2.80	Pass
High channel 2480MHz	0.33	Pass





Test Method

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit [kHz]

N/A





Bluetooth Mode GFSK Modulation test result

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-70 dBm -80 dBm

CF 2.402 GHz

Date: 17.NOV.2014 11:24:57

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Measuring...

LX

691 pts

Page 16 of 44

Span 3.0 MHz

17.11.2014 11:24:56





Date: 17.NOV.2014 12:49:09



Date: 17.NOV.2014 11:26:35

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Page 17 of 44





Date: 17.NOV.2014 12:52:51



Date: 17.NOV.2014 13:00:24

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Page 18 of 44



Frequency 20 dB Bandwidth 99% Bandwidth Limit Result MHz kHz kHz kHz 1211.3 Pass 2402 1354.6 --1202.6 2441 1363.2 Pass --1198.3 2480 1345.9 Pass --**T** Spectrum ● RBW 30 kHz SWT 63.2 µs ● VBW 100 kHz Ref Level 14.00 dBm 30 dB Mode Auto FFT Att ●1Pk Max M1[1] 27.01 dBn 10 dBm· 2.40131400 GHz -6.62 dBm M2[1] 0 dBm 2.40199130 GH -10 dBm -20 dBm-Q1 -26.620 -30 dBm-40 dBm 50 dBm--60 dBm -70 dBm -80 dBm· CF 2.402 GHz 691 pts Span 3.0 MHz Marker Y-value -27.01 dBm Type Ref Trc X-value Function Function Result 2.401314 GHz Μ1 1.3546 MHz 2.4019913 GHz D1 M1 0.80 dB M2 -6.62 dBm 17.11.2014 11:21:48 Measuring... Date: 17.NOV.2014 11:21:48 **P** Spectrum Ref Level 14.00 dBm RBW 30 kHz SWT 63.2 µs - VBW 100 kHz 30 dB Mode Auto FFT Att ●1Pk Ma M1[1] -6.64 dBm 10 dBm 2.40214760 GHz 1.211287988 MHz Occ Bw 0 dBm M1 -10 dBm -20 dBm -30 dBm 40 dBm 50 dBm -60 dBm -70 dBm--80 dBm CF 2.402 GHz 691 pts Span 3.0 MHz

Bluetooth Mode π /4-DQPSK Modulation test result

Date: 17.NOV.2014 11:18:29

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Measuring...

BREEK

LX0

Page 19 of 44

17.11.2014 11:18:29





Date: 17.NOV.2014 12:41:55



Date: 17.NOV.2014 11:28:41

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Page 20 of 44





Date: 17.NOV.2014 12:58:23



Date: 17.NOV.2014 12:59:04

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Page 21 of 44





Bluetooth Mode 8DPSK Modulation test result

Date: 17.NOV.2014 11:15:19

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Measuring...

Page 22 of 44

17.11.2014 11:15:19





Date: 17.NOV.2014 12:45:42



Date: 17.NOV.2014 11:27:38

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Page 23 of 44





Date: 17.NOV.2014 12:55:22



Date: 17.NOV.2014 12:59:39

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Page 24 of 44

9.4 Carrier Frequency Separation

Test Method

- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. By using the Max-Hold function record the separation of two adjacent channels.
- 3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit kHz

≥25KHz or 2/3 of the 20 dB bandwidth which is greater

GFSK Modulation Limit

Frequency	2/3 of 20 dB Bandwidth
MHz	kHz
2402	613.6
2441	610.7
2480	683.1





Carrier Frequency Separation

Test result: The measurement was performed with the typical configuration (normal hopping status), here GFSK modulation mode was used to show compliance.

GFSK Modulation test result

Frequency	Carrier Frequency Separation	Result
MHz	kHz	
2402	991.3	Pass
2441	991.3	Pass
2480	991.3	Pass



Date: 17.NOV.2014 13:15:14

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9.5 Number of hopping frequencies

Test Method

- Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
- 2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
- 3. Record all the signals from each channel until each one has been recorded.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

Limit number

≥ 15





Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the all modulation mode according with the Bluetooth Core Specification. Here GFSK modulation mode was used to show compliance.



Date: 17.NOV.2014 09:11:11

9.6 Dwell Time

Test Method

- 1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. Equipment mode: Spectrum analyzer
- 2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
- 3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
- 4. Measure the Dwell Time by spectrum analyzer Marker function.
- 5. Repeat above procedures until all frequencies measured were complete.

Limit

According to §15.247(a)(1)(iii) & RSS-210 A8.1(c) The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.



Dwell Time

Dwell time

The maximum dwell time shall be 0,4 s.

According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows: The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s*ch];

The burst width, which is directly measured, refers to the duration on one channel hop.

The maximum number of hopping channels in 31.6s for DH5=1600 / 6 / 79 *31.6=106.67

Test Result

Modulation	Mode	Reading (µs)	Total Hops	Test Result (ms)	Limit (ms)	Result
GFSK	DH5	2942	106.67	313.82	< 400	Pass
π/4-DQPSK	2DH5	2942	106.67	313.82	< 400	Pass
8-DPSK	3DH5	2957	106.67	315.42	< 400	Pass

GFSK Modulation

Spectrun	n								
Ref Leve Att SGL TRG: V	1 15.00 dBm 30 dB	e swt 1	● RB¥ 0 ms ● VB\	VIMHz VIMHz					
1Pk Max	10								
10 dBm					D		-0.63 dB 2.9420 ms		
0 dBm					M	1[1] 	I	-	-29.0 µs
-10 dBm—	TRG -7.000	dBm							
-20 dBm									
-30 dBm—									
-40 dBm—									
-50 dBm	maria k N	1				alist di anna 1	h da di ba	مر المراجع	i Laviane La
-60 dBm	muh lannillinini			1	-hilp Harow	hair Allah	ո օրոնդիկինուլ ու	Juliandrava	ho.ha
-70 dBm—									
-80 dBm									
CF 2.441 (GHz			691	pts				1.0 ms/
					A C	teady		1/0	17.11.2014 10:28:33

Date: 17.NOV.2014 10:28:33

DH5

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Page 30 of 44





$\pi/4$ -DQPSK Modulation





8-DPSK Modulation

T Spectrum Ref Level 15.00 dBm RBW 1 MHz Att 30 dB 👄 SWT 10 ms 👄 VBW 1 MHz SGL TRG: VID ●1Pk Max D1[1] -2.68 dE 10 dBm 2.9565 m M1[1] 54.09 dBn -29.0 µ 0 dBm TRG -7.000 dB -10 dBm--20 dBm -30 dBm-40 dBm· -50 dBm and with the many of the way of the sound of the second of , why have provided and public of the public -60 dBm· -70 dBm -80 dBm-CF 2.441 GHz 691 pts 1.0 ms/ 10:27:45 Ready Date: 17.NOV.2014 10:27:45



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Page 31 of 44

9.7 Spurious RF conducted emissions

Test Method

- Use the following spectrum analyzer settings: Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span. RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 3. The level displayed must comply with the limit specified in this Section. Submit these plots.
- 4. Repeat above procedures until all frequencies measured were complete.

Limit

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



Spurious RF conducted emissions



Only the worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

2402MHz



Date: 17.NOV.2014 09:27:04

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2441MHz

Defievel	7 00 d0m	Offeet	1.00 40	- 00.00	100 kus					7]
Att	7.00 dBm 30 dB	SWT	9.7 ms	■ KBW	100 KHZ 300 kHz	Mode 4	uto Sween			
1Pk Max						Houe A	ato oncop			
						М	1[1]			-57.47 dBi
dBm										780.30 MH
10 dBm			_							
20 dBm—			_							_
	01 -24.470	dBm	_							
0 dBm										_
+0 dBm			_							_
i0 dBm										_
								M1		
0.dBmm	, Minadportation	(manutation)	nturan.	hlahulan	many with	mullim	ىدىد بايرالى مەنىرىدىر.	ملغآ سغاني يربدها	al adultance	- du un al and a
		[·								
'0 dBm —			_							
30 dBm										_
I								1		
90 dBm			_							
90 dBm	MHz				691	pts				Stop 1.0 GHz
e: 17 NOV 2	MHz	54			691	pts Mea	suring		4/4	Stop 1.0 GHz 17.11.2014 09:24:54
00 dBm tart 30.0 M e: 17.NOV.2	MHz 2014 09:24:6	54			691	pts Mea	suring		4,40	Stop 1.0 GHz 17.11.2014 09:24:54
e: 17.NOV.2	MHz 2014 09:24:5 7.00 dBm	54 Offset	1.00 dB	RBW	691	pts Mea	suring		4,70	Stop 1.0 GHz 17.11.2014 09:24:54
e: 17.NOV.2 pectrum Ref Level Att	MHz 2014 09:24:5 7.00 dBm 30 dB	Offset SWT	1.00 dB 240 ms	RBW	691 100 kHz 300 kHz	pts Mea	suring		436	Stop 1.0 GH2 17.11.2014 09:24:54
e: 17.NOV.2 pectrum Ref Level Att 1Pk Max	MHz 2014 09:24:5 7.00 dBm 30 dB	0ffset SWT	1.00 dB 240 ms	RBW VBW	691 100 kHz 300 kHz	pts Mea Mode A	uto Sweep		4/4	Stop 1.0 GH2 17,11.2014 09:24:54
e: 17.NOV.2	VIHz 2014 09:24:5 7.00 dBm 30 dB	0ffset SWT	1.00 dB 240 ms	• RBW	691 100 kHz 300 kHz	pts Mea Mode A	uto Sweep		490	Stop 1.0 GH2 17.11.2014 09:24:54
20 dBm tart 30.0 M e: 17.NOV.2 Spectrum Ref Level Att 1Pk Max dBm	VIHZ 2014 09:24:8 7.00 dBm 30 dB	0ffset SWT	1.00 dB 240 ms	RBW VBW	691	pts Mea Mode A	uto Sweep			Stop 1.0 GHz 17.11.2014 09:24:54 (T 7 -4.47 dBi 2.4410 GH
e: 17.NOV.2	MHz 2014 09:24:8 7.00 dBm 30 dB	0ffset SWT	1.00 dB 240 ms o	RBW VBW	691	pts Mea Mode A	uto Sweep			Stop 1.0 GHz 17,11,2014 09:24:54 (T 7 -4.47 dBi 2.4410 GH
e: 17.NOV.2	MHz 2014 09:24:5 7.00 dBm 30 dB	0ffset SWT	1.00 dB 240 ms	RBW	691	pts Mea Mode A	uto Sweep		4,424	Stop 1.0 GHz 17,11,2014 09:24:54 (T 7 -4.47 dB) 2.4410 GH
20 dBm tart 30.0 M ie: 17.NOV.2 Spectrum Ref Level Att 1Pk Max dBm 1Pk Max 10 dBm	VIHZ 2014 09:24:5 7.00 dBm 30 dB	offset swt	1.00 dB 240 ms	RBW	691 100 kHz 300 kHz	pts Mea Mode A	uto Sweep			-4.47 dB/ 2.4410 GH
Codem	VIHz 2014 09:24:5 7.00 dBm 30 dB	offset SWT	1.00 dB 240 ms	RBW VBW	691 100 kHz 300 kHz	pts Mode A	uto Sweep			-4.47 dB/ 2.4410 GH
Codem C	VIHz 2014 09:24:5 7.00 dBm 30 dB	offset swr	1.00 dB 240 ms	RBW	691	pts Mode A	uto Sweep			Stop 1.0 GHz 17.11.2014 09:24:54
O dBm tart 30.0 N pectrum Ref Level Att IPk Max dBm 20 dBm C 30 dBm C	VIHz 014 09:24:5 7.00 dBm 30 dB 01 -24.470	offset SWT	1.00 dB 240 ms	RBW	691	pts Mode A	uto Sweep			-4.47 dB 2.4410 GH
O dBm tart 30.0 N tart 30.0 N control of the second sec	VIHz 2014 09:24:5 7.00 dBm 30 dB	Offset SWT	1.00 dB 240 ms	• RBW	691	pts Mode A	uto Sweep			Stop 1.0 GH2 17.11.2014 09:24:54 -4.47 dBn 2.4410 GH
00 dBm	VIHz 2014 09:24:5 7.00 dBm 30 dB 201 -24.470	offset SWT	1.00 dB 240 ms o	RBW VBW	691	pts Mode A	uto Sweep			-4.47 dB 2.4410 GH
00 dBm tart 30.0 N tart 30.0 N tart 30.0 N control (100 Not (1	VIHz 2014 09:24:5 7.00 dBm 30 dB	offset SWT	1.00 dB 240 ms 3	RBW VBW	691	pts Mode A	uto Sweep			-4.47 dBi
0 dBm tart 30.0 N e: 17.NOV.2 pectrum Ref Level Att IPk Max dBm 10 dBm 0 dBm 10 dBm 10 dBm 10 dBm 10 dBm	VIHz 2014 09:24:5 7.00 dBm 30 dB 201 -24.470	dBm-	1.00 dB 240 ms 3	RBW VBW	691	Mode A	uto Sweep			-4.47 dBi 2.4410 GH

Date: 17.NOV.2014 09:24:36

-70 dBm -80 dBm -90 dBm Start 1.0 GHz

EMC_SZ_FR_21.00 FCC Release 2014-03-20 691 pts

Measuring...

4,0

Stop 25.0 GHz 17.11.2014 99:24:36



Spurious RF conducted emissions

2480MHz

opoonan									
Ref Leve	7.00 dBm	Offset	1.00 dB	RBW 100 ki	Hz Hz Mada				
1Pk Max	30 UB	3111	9.7 ms 🖷	YDW 300 K	12 Mode	Auto Sweep			
					1	M1[1]			-57.42 dBn
) dBm			_			1	1	1	960.00 MH
-10 dBm			_						
20 dBm	D1 22.040	dam							
	01 -22.040								
-30 dBm									
-40 dBm									
-50 dBm									M1
co do-							الأنفر بالمراجع والمار		Note many a Making
-9%.gpm	allandan turun	and they	when the second	new pulling	10 million				
70 dBm									
-70 übiii									
-80 dBm									
oo abiii									
-90 dBm			_						
-90 dBm	MHz			69	1 pts				Stop 1.0 GHz
90 dBm	MHz			69)1 pts Me	asuring		440	Stop 1.0 GHz 17.11.2014 09:23:51
-90 dBm	MHz 2014 09:23:5	52		69	D1 pts Me	asuring		1,10	Stop 1.0 GHz 17.11.2014 09:23:51
-90 dBm	MHz 2014 09:23:5	52		69	01 pts Me	asuring		490	Stop 1.0 GHz 17.11.2014 09:23:51
90 dBm Start 30.0 Ite: 17.NOV. Spectrun	MHz 2014 09:23:5	52		69	D1 pts	asuring		1,90	Stop 1.0 GHz 17.11.2014 09:23:51
90 dBm start 30.0 ate: 17.NOV. Spectrun Ref Leve Att	MHz 2014 09:23:6 n I 7.00 dBm 30 dB	52 Offset SWT	1.00 dB 240 ms	69 69 88W 100 kH	Hz Hz Hz Mode	asuring		196	Stop 1.0 GHz 17.11.2014 09:23:51 ∕
90 dBm start 30.0 ate: 17.NOV. Spectrun Ref Leve Att 1Pk Max	MHz 2014 09:23:6 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB 240 ms	65 68 8 RBW 100 kł	Hz Hz Mode	Auto Sweep		4,96	Stop 1.0 GHz 17.112014 09:23:51
-90 dBm	MHz 2014 09:23:6 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB 240 ms	65 RBW 100 kł	Hz Hz Hz Hz Mode	Auto Sweep			Stop 1.0 GHz 17.112014 09:23:51 ∕⁄
90 dBm Start 30.0 ster 17.NOV. Spectrun Ref Leve Att 1Pk Max 0 dBm ⁴¹	MHz 2014 09:23:5 n I 7.00 dBm 30 dB	52 Offset SWT	1.00 dB 240 ms	65 0 RBW 100 kł	Hz Hz Hz Hz	Auto Sweep		1 4/2	Stop 1.0 GHz 17.112014 09:23:51 ∕⁄
-90 dBm	MHz 2014 09:23:5 n I 7.00 dBm 30 dB	52 Offset SWT	1.00 dB 240 ms	65 65 68 88 80 88 80 80 80 80 80 80 8	Hz Hz Hz Hz Hz	Auto Sweep	••••••		Stop 1.0 GHz 17.112014 09:23:51 ∕⁄
-90 dBm	MHz 2014 09:23:5 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB = 240 ms =	RBW 100 kł VBW 300 kł	Hz Hz Hz Hz	Auto Sweep			Stop 1.0 GHz 17.112014 09:23:51 ∕⁄
90 dBm	MHz 2014 09:23:5 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB = 240 ms =	RBW 100 kH	Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz H	Auto Sweep			Stop 1.0 GHz 17.112014 09:23:51 ∕⁄
90 dBm Start 30.0 start 30.0 Spectrun Ref Leve Att 10 dBm 20 dBm 20 dBm	MHz 2014 09:23:5 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB 240 ms		Hz Hz Hz Hz	Auto Sweep			Stop 1.0 GHz 17.11.2014 09:23:51 ∠
-90 dBm Start 30.0 Start 30.0 Spectrun Ref Leve Att 1Pk Max -10 dBm -20 dBm	MHz 2014 09:23:5 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB 240 ms		Hz Hz Hz Hz Hz	Auto Sweep			Stop 1.0 GHz 17.112014 09:23:51 ∕⁄ ⊽ -2.84 dBm 2.4760 GHz
-90 dBm	MHz 2014 09:23:5 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB = 240 ms =		Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz H	Auto Sweep			Stop 1.0 GHz 17.11.2014 09:23:51 ∠
90 dBm Start 30.0 Start 30.0 Spectrun Ref Leve Att 1Pk Max 0 dBm -10 dBm -20 dBm -10 dBm	MHz 2014 09:23:5 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB 2240 ms	65 0 RBW 100 kł 0 VBW 300 kł	Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz H	Auto Sweep			Stop 1.0 GHz 17.11.2014 09:23:51 ∠
90 dBm Start 30.0 Start 30.0 Spectrun Ref Leve Att 1Pk Max 0 dBm -10 dBm -20 dBm -40 dBm	MHz 2014 09:23:5 n 1 7.00 dBm 30 dB	52 Offset SWT	1.00 dB (240 ms (RBW 100 kł VBW 300 kł	Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz H	Auto Sweep			Stop 1.0 GHz 17.11.2014 09:23:51 ∠
90 dBm Start 30.0 Start 30.0 Spectrun Ref Leve Att 10 dBm 20 dBm 40 dBm 50 dBm	MHz 2014 09:23:5 n I 7.00 dBm 30 dB	52 Offset SWT	1.00 dB (240 ms (RBW 100 kł VBW 300 kł	12 12 12 12 12 12 12 12 12 12	Auto Sweep			Stop 1.0 GHz 17.11.2014 09:23:51 2 -2.84 dBn 2.4760 GHz
90 dBm 3tart 30.0 Start 30.0 Start 30.0 Spectrun Ref Leve Att 10 dBm 20 dBm 40 dBm 50 dBm 50 dBm	MHz 2014 09:23:5 n I 7.00 dBm 30 dB	52 Offset SWT	1.00 dB (240 ms (RBW 100 kł VBW 300 kł	12 12 12 12 12 12 12 12 12 12	Auto Sweep			Stop 1.0 GHz 17.11.2014 09:23:51 ∠ -2.84 dBn 2.4760 GHz

Date: 17.NOV.2014 09:23:19

-70 dBm--80 dBm--90 dBm-

Start 1.0 GHz

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691 pts

Measuring...

4,0

Page 35 of 44

Stop 25.0 GHz

7.11.2014 09:23:19





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 \geq 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. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

Limit:

According to §15.247(d) and RSS-210 A8.5, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen7.2.2, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

GFSK Modulation Test Result: Hopping on mode:

Spectr	rum)													ſ	•
Ref Lev	vel	9.00 (dBm				RBW	100 kHz									
Att		25	5 dB	SWT :	227.5	µs 😑	VBW	300 kHz	Mo	ode Aut	o FFT						_
⊖1Pk Ma	эх																
										M	1[1]					·2.79 d	Bm
0 dBm—	_								-						2.40	2980	GHz
										M	2[1]				-6	9.PA 1	BR
-10 dBm									-					_	2.39	YYYYY A	1444
																JUNNIN	(WW
-20 dBm	1-1-	01 0	0.700	dD ex-													•
		DI -2	2.790													1	
-30 dBm	<u>ו</u>								1					-			_
																	_ I
-40 dBm														-			
																J	_ I
-50 dBm	1																
60 d9m																	
-00 0011		1			uhr	Job								M2			
-70 dBm	~	Jul ou	s and a second	and the			~~~~	-	mun	mak	- and the second se	Ser.	man	mary	~~~~~~		
, e ab																	_ I
-80 dBm														_			
																	_ I
Start 2	.31 (GHz						691	pts						Stop	2.41 G	Hz
Marker		1 -															
Type	Ref	Tro		<u>X-v</u>	alue	0.011-		Y-value		Func	tion		Fi	Inction	Result		_
M1 M2		-	1	2	.4029		-	-2.79 di	sm ano								-1
M3			1		2.3	4 GHz		-65.09 di	Am								-
110		20	-		21	, and		00.05 0				_			17	11 2014	_
										Mea	suring			L XI	1/	14:39:12	///
Doto: 17 N		014 4	1.20.1	2													
Jale. 17.IN	IOV.2	2014 1	4.39.1	5													
																	_
	_		`													(-



Date: 17.NOV.2014 14:42:49

EMC_SZ_FR_21.00 FCC Release 2014-03-20



Hopping off mode:

Spect	rum										
Ref Le	vel 9	.00 dBm		👄 RE	3W 100 kHz						
Att		25 dB	SWT 227.5	i µs 🖷 VE	3W 300 kHz	Mode Aut	O FFT				
●1Pk M	ax										
						M	1[1]			-1.90 dBm	
									2.40	02110 GHz	
o ubiii-						M	2[1]		-6	-66.47 dBm	
10 dBm									2.39	90000 GHz	
-10 ubii	-										
-20 dBm	$ \square $									Λ	
-20 ubn	<u>-</u> 0	1 -21.900	dBm								
-30 dBm											
50 abii	'										
-40 dBm										11	
io abii	'										
-50 dBm											
-30 ubii	'									<u> </u>	
-60 dBm									м		
a	: L		mound	mouth and a				M	2	· .	
-70 dBm	- Company	-ward we		. Course	- may and a mark	hand	- Second Con	handlessee	and a second	- warn	
70 abii	·										
-80 dBr											
00 001	'										
Start 2	.31 G	Hz			691	pts			Stop	2.41 GHz	
Marker											
Туре	Ref	Trc	X-value		Y-value	Func	tion	Fund	tion Result	1	
M1		1	2.4021	L1 GHz	-1.90 dB	m					
M2		1	2.3	39 GHz	-66.47 dB	m					
M3		1	2	.4 GHz	-63.42 dB	m					
						Mea	suring	(Income)	100 10	7.11.2014	
									-	13:03:18 ///	

Date: 17.NOV.2014 15:05:18



Date: 17.NOV.2014 15:07:29

EMC_SZ_FR_21.00 FCC Release 2014-03-20 Page 38 of 44



8DPSK Modulation Test Result: Hopping on mode:

Spectrun	n					
RefLevel	9.00 dBm	-	RBW 100 kHz			()
Att	25 dB	SWT 227.5 us	VBW 300 kHz 1	Ande Auto FET		
1Pk Max		0111 EE110 pr -				
				M1[1]		-4 98 dBr
						2.408910 GH
i dBm——				M2[1]		-66.81 dB
						2.390000000
10 dBm—						10.00
20 dBm						
	D1 -24.980) dBm				
30 dBm—						
40 dBm—						
50 dBm—						
60 dBm					M2	MB
nurvenze	manne	www.	- marken markene	monor por	your miller	yment
70 dBm-						
30 dBm—						
	011-		(01 -	-		010.44.011-
tart 2.31	GHZ		041 h	15		SLUP 2.41 GH2
arker	<u>(- </u>			1		
Type Re	f Trc	X-value	Y-value	Function	Functi	on Result
M1	1	2.40891 GHz	-4.98 dBm			
M2	1	2.39 GHZ	-65.81 dBm			
M3	1	2.4 GHZ	-05.50 dBm			
				Measuring.		17.11.2014

ate: 17.NOV.2014 14:58:09

Spect	rum													
Ref Le	vel 9	.00 dB	m			RBW	100 kHz							
Att		25 0	dB SW	T 75.9	µs 👄	vbw	300 kHz	Mod	e Auto	FFT				
😑 1Pk M	ax													
0 dBritt	ļ								M	1[1]			2.47	-3.62 dBm 789820 GHz
m Mar M	m								i vi	2[1]			2 49	-00.03 UBM 235000 CHz
-10 dBn	n -		-					<u> </u>					2.10	
-20 dBn	n-													
-30 dBn	n	1 -23.	620 dBm)										
-40 dBn	n													
-50 dBn	n	4	_					<u> </u>						
-60 dBn	n+	t	M2		hard	. h			Autor		M	3		and a state of a
-70 dBn	n			· · · · ·			o - y arrand							
-80 dBn	n+													
Start 2	2.477	GHz					691	pts					Stop	2.51 GHz
Marker								_						
Туре	Ref	Trc	1	X-value)		Y-value		Func	tion		Fund	ction Result	t
M1		1		2.4789	82 GH:	2	-3.62 dE	m						
M2		1		2.48	35 GH:	z	-66.05 dE	m						
M3		1		2	.5 GH:	z	-65.01 dE	m						
		\mathbf{N}							Mea	suring.	. (4/0	17.11.2014 14:46:39

Date: 17.NOV.2014 14:46:40

EMC_SZ_FR_21.00 FCC Release 2014-03-20

Page 39 of 44



Hopping off mode:

Spect	rum									
Ref Le	vel 9	.00 dBm		👄 RE	W 100 kHz					
Att		25 dB	SWT 227.5	5 µs 👄 🛛 🛛	300 kHz	Mode Aut	to FFT			
⊖1Pk Ma	ах									
						M	1[1]			-4.33 dBm
0 dBm—									2.4	02110 GHz
						M	2[1]		-	65.54 dBm
-10 dBm	∩				_				2.3	90000 GHz
-20 dBm	∩— -				_					
	D	1 -24.340	dBm		-					
-30 dBm	∩									
-40 dBm	∩+-				-					
										MU
-50 dBm										
-60 dBm								M	2	F 4.
houghur	your	where mere	person and	man	infratrision	presenter	malita	mound	awyourd	wormed w
-70 aBm										
00 d0 m										
-00 UBII	-									
Start 2.31 GHz 691 pts Stop 2.41 GHz										
Marker										
Туре	Ref	Trc	X-value		Y-value	Func	tion	Fund	tion Result	
M1		1	2.402	11 GHz	-4.33 dB	m				
M2		1	2.3	39 GHz	-65.54 dB	m				
<u>M3</u>			2	.4 GHz	-63.47 dB	m				
][]				Mea	suring		4/0	17.11.2014 15:01:37

Date: 17.NOV.2014 15:01:37



Date: 17.NOV.2014 15:08:47

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Page 40 of 44





9.9 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.
- 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 C63.4-2009 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



Spurious radiated emissions for transmitter and receiver

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.

The only worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

Transmitting spurious emission test result as below:

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
872.8	41.64	Horizontal	46	QP	4.36	Pass
945.5	40.58	Horizontal	46	QP	5.42	Pass
872.8	38.26	Vertical	46	QP	7.74	Pass
945.5	40.84	Vertical	46	QP	5.16	Pass
*4804	41.93	Horizontal	74	PK	32.07	Pass
*4804	40.48	Vertical	74	PK	33.52	Pass

Bluetooth Mode GFSK Modulation 2402MHz Test Result

Bluetooth Mode GFSK Modulation 2441MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
*4882	41.58	Horizontal	74	PK	32.42	Pass
*4882	42.21	Vertical	74	PK	31.79	Pass

Bluetooth Mode GFSK Modulation 2480MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
*4960	41.92	Horizontal	74	PK	32.08	Pass
*4960	41.32	Vertical	74	PK	32.68	Pass

Remark:

- (1) AV Emission Level= PK Emission Level+20log(dutycycle)
- (2) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE	
	Test Receiver	Rohde & Schwarz	ESHS10	838693/001	Nov.04, 15	\square
	L.I.S.N.#1	Rohde & Schwarz	ESH2-Z5	834066/011	Nov.04, 15	\boxtimes
	L.I.S.N.#3	Kyoritsu	KNW-242C	8-1920-1	May.07, 15	
CE	RF Cable	3D-2W	Fujikura	LISN Cable 1#	May.07, 15	\boxtimes
	Coaxial Switch	MP59B	Anritsu	M55367	May.07, 15	\square
	Passive Probe	ESH2-Z3	Rohde & Schwarz	299.7810.52	May.07, 15	
	Pulse Limiter	ESH3-Z2	Rohde & Schwarz	100341	May.07, 15	
С	Spectrum	Rohde & Schwarz	FSV40	101030	May.08, 15	\square
RE < 1	Test Receiver <1GHz	Rohde & Schwarz	ESVS10	834468/011	May.07, 15	\boxtimes
GHz	Amplifier < 1 GHz	HP	8447D	2648A04738	May.07, 15	\boxtimes
	HF Cable	Hubersuhne	Sucoflex104	Room 2	May.08, 15	\square
	Bilog Antenna	Schaffner	CBL6111C	2598	Oct.25, 15	\boxtimes
RE	Spectrum > 1GHz	Agilent	E4446A	US44300459	May.08, 15	\square
> 1 GHz	Horn Antenna	EMCO	3115	9607-4877	Jun. 24, 15	\square
	Amp > 1 Ghz	HP	8449B	3008A08495	May.08, 15	\square
	HF Cable	Hubersuhne	Sucoflex104	Room1	May.08, 15	\square

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- 20dB bandwidth and 99% Occupied Bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time
- Power spectral density*
- Spurious RF conducted emissions
- Band edge





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:

Items	Extended Uncertainty					
Padiated spurious omission	4.32dB (30MHz-1GHz)					
Radiated spurious emission	2.27dB (1GHz -25GHz)					
Conducted spurious emission	2.10dB(30MHz-25GHz)					
Bandwidth test	1*10 ⁻⁹					
Conducted emission	2.4dB					

System Measurement Uncertainty