

FCC CFR47 PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

BLUTOOTH MODULE 4.0 + EDR / LE

MODEL NUMBER: WIN-B2

FCC ID: MCLWINB2 IC: 2878D-WINB2

REPORT NUMBER: 11J13630-1

ISSUE DATE: MARCH 2, 2011

Prepared for HON HAI PRECISION IND. CO., LTD. 5F-1, 5 HSIN-AN ROAD HSINCHU SCIENCE-BASED INDUSTRIAL PARK TAIWAN, R.O.C.

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NVLAP LAB CODE 200065-0

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Revision History

Rev.	Date	Revisions	Revised By
	03/02/2011	Initial Issue	T. Chan

Page 2 of 153

TABLE OF CONTENTS

1.	ATTESTATION OF TEST RESULTS	5
2.	TEST METHODOLOGY	6
3.	FACILITIES AND ACCREDITATION	6
4.	CALIBRATION AND UNCERTAINTY	6
4	1.1. MEASURING INSTRUMENT CALIBRATION	6
4	1.2. SAMPLE CALCULATION	6
4	A.3. MEASUREMENT UNCERTAINTY	6
5		7
5		7
- -		/
5	5.2. MAXIMUM OUTPUT POWER	/
5	5.3. DESCRIPTION OF AVAILABLE ANTENNAS	7
5	5.4. SOFTWARE AND FIRMWARE	7
5	5.5. WORST-CASE CONFIGURATION AND MODE	7
5	5.6. DESCRIPTION OF TEST SETUP	8
6.	TEST AND MEASUREMENT EQUIPMENT	10
7	ANTENNA PORT TEST RESULTS	11
	7.1.1. 20 dB AND 99% BANDWIDTH	11
	7.1.2. HOPPING FREQUENCY SEPARATION	. 18
	7.1.3. NUMBER OF HOPPING CHANNELS	20
	7.1.4. AVERAGE TIME OF OCCUPANCY	25
	7.1.5. OUTPUT POWER	29
	7.1.7. CONDUCTED SPURIOUS EMISSIONS	34
7	2.2. ENHANCED DATA RATE 8PSK MODULATION	43
	7.2.1. 20 dB AND 99% BANDWIDTH	43
	7.2.2. HOPPING FREQUENCY SEPARATION	50
	7.2.3. NUMBER OF HOPPING CHANNELS	52
	7.2.4. AVERAGE TIME OF OCCOPANCE	61
	7.2.6. AVERAGE POWER	65
	7.2.7. CONDUCTED SPURIOUS EMISSIONS	66
7	7.3. LE GFSK MODE	75
	7.3.1. 20 dB AND 99% BANDWIDTH	75
	7.3.2. HOPPING FREQUENCY SEPARATION	82
		84
	7.3.5 OUTPUT POWER	. 09
	7.3.6. AVERAGE POWER	96
	Page 3 of 153	
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	7.3	3.7.	CO	NDU	CTED	SPURIC	OUS E	EMISS	SIONS	S		 	 	 . 97
8.	R	ADIA [.]	TED T	EST	RESUL	.TS						 	 	 106
ė	3.1.	LI	MITS	AND .	PROCI	EDURE	Ξ					 	 	 106
à	3.2. 8.2 8.2 8.2	<i>TI</i> 2.1. 2.2. 2.3.	RANSI BAS ENI LE	<i>MITTL</i> SIC D HAN(GFSI	ER AB(DATA R CED DA K MOD	OVE 1 (ATE G ATA RA E	GHZ FSK M ATE 8F	MODL PSK N	JLATI MODL	ON JLATI	ION .	 	 	 <i>107</i> 107 116 125
ė	3.3.	R	ECEIV	'ER A	BOVE	1 GHz.						 	 	 134
ė	3.4.	W	ORST	-CAS	SE BEL	OW 1 (GHz					 	 	 135
9.	A		WER I	INE	COND	UCTED	D EMIS	SSION	NS			 	 	 137
10		МАХ	KIMUM	PER	MISSI	BLE EX	KPOSI	URE .				 	 	 141
11		SET	UP PH	юто	S							 	 	 144

Page 4 of 153

1. ATTESTATION OF TEST RESULTS

	APPLICABLE STANDARDS
DATE TESTED:	FEBRUARY 09-14 to March 01, 2011
SERIAL NUMBER:	D66BF7EFD0AE, D66BF7EFD0AB, A4C0E12724C4, A4C0E1272470.
MODEL:	WIN-B2
EUT DESCRIPTION:	BLUETOOTH MODULE 4.0 +EDR/LE
COMPANY NAME:	HON HAI PRECISION IND. CO., LTD. 5F-1, 5 HSIN ROAD HSINCHU SCIENCE-BASED INDUSTRIAL PARK TAIWAN, R.O.C.

STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

Tested By:

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Page 5 of 153

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <u>http://www.ccsemc.com</u>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

Page 6 of 153

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth 4.0 + EDR/LE Module.

The radio module is manufactured by Hon Hai Precision.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range	Mode	Output Power	Output Power
(MHz)		(dBm)	(mW)
2402 - 2480	Basic GFSK	1.54	1.43
2402 - 2480	Enhanced 8PSK	4.46	2.79
2402 - 2480	LE GFSK	-0.92	0.81

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of 2.91 dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was BT usb driver, v5.1.0.1400.

The test utility software used during testing was Bluetool_MI_1.3.5.5.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

All final tests in the GFSK mode were made at 1 Mb/s. All final tests in the 8PSK mode were made at 3 Mb/s.

For radiated emissions below 1 GHz the worst-case configuration is determined to be the mode and channel with the highest output power.

The EUT was investigated in three different positions, X, Y, & Z and turned out the X was worstposition. This worst position will be set for all radiated emissions testing.

Page 7 of 153

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST							
Description Manufacturer Model Serial Number FCC ID							
Laptop	HP Compag	Presario	CNF7458G3Q	DoC			
AC Adapter	HP Compag	DC359A	F3-07091411250E	N/A			
Conversion Board	Marko	96.9922	5	N/A			

I/O CABLES

	I/O CABLE LIST								
Cable	Port	# of	Connector	Cable	Cable	Remarks			
No.		Identica	Туре	Туре	Length				
		Ports							
1	AC	1	AC	Unshielded	1.8m	N/A			
2	DC	1	DC	Unshielded	1.8m	N/A			
3	USB	1	USB	Shielded	1.0m	N/A			

TEST SETUP

The EUT is connected to a host laptop computer via conversion board with USB cable during the test. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST								
Description	Manufacturer	Model	Asset	Cal Due				
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/30/11				
Antenna, Horn, 18 GHz	EMCO	3115	C00783	06/29/11				
Preamplifier, 26.5 MHz	Agilent / HP	8449B	C01063	07/14/11				
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/12/11				
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/27/12				
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02684	CNR				
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	05/05/11				
Peak Power Meter	Agilent / HP	E4416A	C00963	12/04/11				
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/04/11				
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11				
EMI Test Receiver, 30 MHz	R&S	ESHS 20	N02396	05/06/11				

Page 10 of 153

7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB AND 99% BANDWIDTH

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to \geq 1% of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

Channel	Frequency	20 dB Bandwidth	99% Bandwidth
	(MHz)	(kHz)	(kHz)
Low	2402	940.973	850.5973
Middle	2441	938.424	909.0983
High	2480	942.354	891.4827

Page 11 of 153

20 dB BANDWIDTH



Page 12 of 153

BANDWIDTH MII	D CH 11, 2011			RТ	Meas Setup
Ch Freq 2 Occupied Bandwidth	2.441 GHz			Trig Free	Avg Number 10 On <u>Off</u>
					Avg Mode <u>Exp</u> <u>Repeat</u>
Ref 10 dBm Att #Peak Log 10	en 10 dB	~~~			Max Hold <u>On Off</u>
dB/ Offst					Occ BW % Pwr 99.00 %
dB Center 2.441 000 GHz	4\/DIM 400			Span 3 MHz	OBW Spar 3.00000000 MHz
Occupied Bandy	width 5 3014 kHz	Occ BW	% Pwr x dB	99.00 % -20.00 dB	x dB -20.00 dB
Transmit Freq Error x dB Bandwidth	-4.104 kHz 938.424 kHz				Optimize Ref Level
Copyright 2000-2010 Agilen	t Technologies				

Page 13 of 153

🔆 Agilent 08:18:24 Fe	b 11, 2011		RT	Meas Setup
Ch Freq Occupied Bandwidth	2.48 GHz		Trig Free	Avg Number 10 On <u>Of</u>
				Avg Mode <u>Exp</u> <u>Repea</u>
Ref 10 dBm A #Peak Log	tten 10 dB			Max Holo <u>On Of</u>
dB/ Offst				Occ BW % Pv 99.00 %
dB Center 2.480 000 GHz	#VBW 100 kt	17 Sween 3	Span 3 MHz	OBW Spa 3.00000000 MHz
	width	Occ BW % Pw	2 ms (our prs)	x dE
85	5.3037 kHz	x dE	-20.00 dB	-20.00 dB
Transmit Freq Error x dB Bandwidth	-3.008 kHz 942.354 kHz			Optimize Ref Level

Page 14 of 153

99% BANDWIDTH



Page 15 of 153

Ch Freq 2.441 GHz Trig Free 100.0 ms Occupied Bandwidth Sweep Sweep Sweep Ref 10 dBm Atten 10 dB Sweep Sweep #Samp Auto Mail Sweep Log Auto Mail Sweep MB/ Atten 10 dB Auto Sweep Center 2.441 000 GHz Span 3 MHz Norm Accv Mail Span 3 MHz Free Span 3 MHz Points Span 3 MHz Points Solution 0 Ccupied Bandwidth Occ BW % Pwr 99.00 % Solution 909.0983 kHz x dB -20.00 dB Solution Transmit Freq Error 1.131 kHz x dB -20.00 dB Solution	BANDWIDTH MID (# Agilent 08:29:17 Feb 11,	CH 2011		R T	Sweep
Ref 10 dBm Atten 10 dB #Samp	Ch Freq 2.44 Occupied Bandwidth	l GHz		Trig Free	Sweep Time 100.0 ms Auto <u>Mar</u>
Ref 10 dBm Atten 10 dB #Samp					Sweep <u>Single Cont</u>
Center 2.441 000 GHz Span 3 MHz #Res BW 30 kHz #VBW 100 kHz #Sweep 100 ms (601 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 909.0983 kHz x dB -20.00 dB Transmit Freq Error 1.131 kHz x dB Bandwidth 825.454 kHz*	Ref 10 dBm Atten ' #Samp Log 10 dB/ Offst 11 dB				Auto Sweep Time Norm <u>Accy</u>
Occupied Bandwidth Occ BW % Pwr 99.00 % Points 909.0983 kHz x dB -20.00 dB 601 Transmit Freq Error 1.131 kHz x dB -20.00 dB x dB Bandwidth 825.454 kHz* 601 601	Center 2.441 000 GHz #Res BW 30 kHz	#VBW 100 kHz	#Sweep 100 г	Span 3 MHz ns (601 pts)	
Transmit Freq Error 1.131 kHz x dB Bandwidth 825.454 kHz*	Occupied Bandwid 909.0	lth 983 kHz	Occ BW % Pwr x dB	99.00 % -20.00 dB	Points 601
	Transmit Freq Error x dB Bandwidth 8	.131 kHz 325.454 kHz*			

Page 16 of 153



Page 17 of 153

7.1.2. HOPPING FREQUENCY SEPARATION

<u>LIMIT</u>

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

Page 18 of 153

HOPPING FREQUENCY SEPARATION



Page 19 of 153

7.1.3. NUMBER OF HOPPING CHANNELS

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

79 Channels observed.

Page 20 of 153

NUMBER OF HOPPING CHANNELS



Page 21 of 153



Page 22 of 153

NUMBER SEGMEN ⁻	OF HO	OPPIN	IG CH	ANN	ELS (30 M	HZ S	6PAN	, SECOND
🔆 Agilent 10:	23:28 Feb	0 11, 2011					F	τя	Trace
Ref 10 dBm	A	tten 10 d	В			Mkr1	2.430 1 1.50	5 GHz) dBm	Trace
#Peak { Log 10 dB/ Offst	YYYY	Mμ	M		YW	Ш	WY	Щ	Clear Write
11 dB									Max Hold
LgAv									Min Hold
M1 S2 S3 FC AA									View
t(f): Tun Swp									Blank
tart 2.430 00 (Res BW 300 k	GHz Hz		VBW 300	kHz	S	Stop 2 weep 1	2.460 00 ms (601) GHz Ipts)	More 1 of 2
No Peak Found									

Page 23 of 153



Page 24 of 153

7.1.4. AVERAGE TIME OF OCCUPANCY

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

GFSK Mode

DH Packet	Pulse	Number of	Average	Limit	Margin
	Width	Pulses in	Time of		
	(msec)	3.16	(sec)	(sec)	(sec)
		seconds			
DH1	0.395	32	0.126	0.4	-0.274
DH3	1.657	17	0.282	0.4	-0.118
DH5	2.9	10	0.290	0.4	-0.110

Page 25 of 153

<u>DH1</u>

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



Page 26 of 153

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<u>DH3</u>

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



Page 27 of 153

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<u>DH5</u>

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



Page 28 of 153

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7.1.5. OUTPUT POWER

<u>LIMIT</u>

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	1.40	30	-28.60
Middle	2441	1.54	30	-28.46
High	2480	1.39	30	-28.61

Page 29 of 153

OUTPUT POWER



Page 30 of 153

R righent fr. h	0.00110010,2011			1 1	T eak Search
tef 10 dBm	Atten 10 dB		Mkr1 2	2.440 950 GHz 1.54 dBm	Next Peak
Peak		1			
0 B/					Next Pk Right
)ffst 1 B					Next Pk Left
gAv					Min Search
I1 S2 ³³ FC					Pk-Pk Search
(f): Tun					Mkr©C
Center 2.441 000) GHz	/PW 2 MH-	#Swoon 2.52	Span 5 MHz	More 1 of 2

Page 31 of 153

				A 170 A75 AU	
tef 10 dBm	Atten 10 d	В	Mkr1	2.479 875 GHz 1.39 dBm	Next Peak
Peak og					
0 B/					Next Pk Right
offst 1 B					Next Pk Left
gAv					Min Search
11 S2 3 FC					Pk-Pk Search
(f): Tun Swp					Mkr©Cl
Center 2.480 000	GHz	#VBW 3 MH7	#Sween 2 52	Span 5 MHz 2 ms (601 nts)	More 1 of 2

Page 32 of 153

7.1.6. AVERAGE POWER

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	1.29
Middle	2441	1.47
High	2480	1.31

Page 33 of 153

7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

Page 34 of 153

SPURIOUS EMISSIONS, LOW CHANNEL



Page 35 of 153



Page 36 of 153
SPURIOUS EMISSIONS, MID CHANNEL



Page 37 of 153



Page 38 of 153

SPURIOUS EMISSIONS, HIGH CHANNEL



Page 39 of 153



Page 40 of 153

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



Page 41 of 153



Page 42 of 153

7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB AND 99% BANDWIDTH

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to \geq 1% of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

Channel	Frequency	20 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(MHz)
Low	2402	1.304	1.1489
Middle	2441	1.304	1.1724
High	2480	1.304	1.1954

Page 43 of 153

20 dB BANDWIDTH

BANDWIDTH LC	DW CH		RТ	Meas Setup
Ch Freq Occupied Bandwidth	2.402 GHz		Trig Free	Avg Number 10 On <u>Off</u>
				Avg Mode <u>Exp</u> <u>Repeat</u>
Ref 10 dBm Ar #Peak Log	ten 10 dB	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Max Hold <u>On Off</u>
dB/ Offst 11	/		~~~~~~	Occ BW % Pw 99.00 %
dB			Span 3 MHz	OBW Spa 3.00000000 MHz
Occupied Band	#VBW 100 kH	Iz Sweep 3.2 Occ BW % Pwr x dB	ms (601 pts) 99.00 % -20.00 dB	X dB -20.00 dB
Transmit Freq Error x dB Bandwidth	-7.583 kHz 1.304 MHz			Optimize Ref Level
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Page 44 of 153

BANDWIDTH MID CH	Meas Setup
Ch Freq 2.441 GHz Trig Free Occupied Bandwidth	Avg Number 10 On <u>Off</u>
	Avg Mode <u>Exp Repeat</u>
Ref 10 dBm Atten 10 dB #Peak Log 10	Max Hold <u>On Off</u>
dB/ Offst 11	Occ BW % Pwr 99.00 %
ab state Center 2.441 000 GHz Span 3 MHz #Res RW 30 kHz #VBW 100 kHz Sweep 3.2 ms (601 pts)	OBW Spar 3.00000000 MHz
Occupied Bandwidth Occ BW % Pwr 99.00 % 1.1732 MHz × dB -20.00 dB	× dB -20.00 dB
Transmit Freq Error -4.941 kHz x dB Bandwidth 1.304 MHz Copyright 2000-2010 Agilent Technologies	Optimize Ref Level

Page 45 of 153



Page 46 of 153

99% BANDWIDTH



Page 47 of 153

BANDWIDTH MID CH * Agilient 08:30:01 Feb 11, 2011 R T	Sweep
Ch Freq 2.441 GHz Trig Free Occupied Bandwidth	Sweep Time 100.0 ms Auto <u>Man</u>
	Sweep <u>Single Cont</u>
Ref 10 dBm Atten 10 dB #Samp	Auto Sweep Time Norm <u>Accy</u>
dB Center 2.441 000 GHz #Res BW 30 kHz #VBW 100 kHz #Sweep 100 ms (601 pts)	
Occupied Bandwidth Occ BW % Pwr 99.00 % 1.1724 MHz × dB -20.00 dB	Points 601
Transmit Freq Error 168.932 Hz x dB Bandwidth 1.268 MHz*	

Page 48 of 153



Page 49 of 153

7.2.2. HOPPING FREQUENCY SEPARATION

<u>LIMIT</u>

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

Page 50 of 153

HOPPING FREQUENCY SEPARATION



Page 51 of 153

7.2.3. NUMBER OF HOPPING CHANNELS

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

79 Channels observed.

Page 52 of 153

NUMBER OF HOPPING CHANNELS



Page 53 of 153



Page 54 of 153

🔆 Ag	ilent 15	:04:31	Feb 17, 3	2011					RT	Trace
Ref0d ∀Rosk	Bm	1	#Atten 1	0 dB	1					Trace
+reak Log 10 dB/	****	~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~	~ ~~~	~~~~	~~~	~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Clear Write
										Max Hol
_gAv										- Min Hol
W1 S2 S3 FC										Viev
¤(f): ⁼Tun Swp										Blanl
Start 2.	430 00 W 300 I	GHz 4Hz		VB	W 300 I	(H7	s	Stop 2	2.460 00 GHz	More 1 of 2

Page 55 of 153



Page 56 of 153

7.2.4. AVERAGE TIME OF OCCUPANCY

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

8PSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupan cy (sec)	Limit (sec)	Margin (sec)
DH1	0.4	30	0.120	0.4	-0.280
DH3	1.668	17	0.284	0.4	-0.116
DH5	2.95	12	0.354	0.4	-0.046

Page 57 of 153

<u>DH1</u>

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



Page 58 of 153

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<u>DH3</u>

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



Page 59 of 153

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<u>DH5</u>

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



Page 60 of 153

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7.2.5. OUTPUT POWER

<u>LIMIT</u>

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	4.46	21	-16.51
Middle	2441	4.45	21	-16.52
High	2480	4.19	21	-16.78

Page 61 of 153

OUTPUT POWER



Page 62 of 153

🔆 Agilent 17:17:	13 Feb 10, 2	011				F	х т	Peak Search
Ref 10 dBm	Atten 10	dB			Mkr1 2.	440 808. 4.45	BGHz 5 dBm	Next Peak
og 0 IB/		î		<u> </u>		<u> </u>		Next Pk Right
IB								Next Pk Left
.gAv								Min Search
И1 S2 53 FC АА								Pk-Pk Search
(f): Tun Տwp								Mkr © Cl
Center 2.441 000 (Res BW 3 MHz	GHz	#VBW 3	MHz	#Swe	ep 2.52	Span ms (601	5 MHz pts)	More 1 of 2

Page 63 of 153

			 ML 4 3	470.000	CII-	
Ref 10 dBm	Atten 10	dB	MIKET Z	4.19 908	dBm	Next Peak
Peak		\$				- Hoxer our
.og 0 IB/		1				Next Pk Right
)ffst 1 IB						Next Pk Left
						Min Search
.gAv						
11 S2 3 FC						Pk-Pk Search
(f): Tun						Mkr © Cl
owp						htoro
Center 2.480 000 @	δHz	4VDW 2 M	 S	Span 	5 MHz	1 of 2

Page 64 of 153

7.2.6. AVERAGE POWER

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	1.75
Middle	2441	1.89
High	2480	1.69

Page 65 of 153

7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

Page 66 of 153

SPURIOUS EMISSIONS, LOW CHANNEL



Page 67 of 153



Page 68 of 153

SPURIOUS EMISSIONS, MID CHANNEL



Page 69 of 153



Page 70 of 153

SPURIOUS EMISSIONS, HIGH CHANNEL



Page 71 of 153



Page 72 of 153
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



Page 73 of 153



Page 74 of 153

7.3. LE GFSK MODE

7.3.1. 20 dB AND 99% BANDWIDTH

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to \geq 1% of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

Channel	Frequency	20 dB Bandwidth	99% Bandwidth
	(MHz)	(MHz)	(kHz)
Low	2402	1.099	954.0432
Middle	2440	1.093	989.3745
High	2480	1.092	931.183

Page 75 of 153

20 dB BANDWIDTH



Page 76 of 153



Page 77 of 153



Page 78 of 153

99% BANDWIDTH



Page 79 of 153



Page 80 of 153



Page 81 of 153

7.3.2. HOPPING FREQUENCY SEPARATION

<u>LIMIT</u>

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

Page 82 of 153

HOPPING FREQUENCY SEPARATION



Page 83 of 153

7.3.3. NUMBER OF HOPPING CHANNELS

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

40 Channels observed, missing three channels at 2402, 2426 and 2480MHz for advertising.

Page 84 of 153

NUMBER OF HOPPING CHANNELS



Page 85 of 153



Page 86 of 153



Page 87 of 153



Page 88 of 153

7.3.4. AVERAGE TIME OF OCCUPANCY

<u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 1.6 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 1.6 second period (39 channels * 0.4 s) is equal to 10 * (# of pulses in 1.6 s) * pulse width.

RESULTS

Time Of Occupancy = 6 pulses * 2.6407-(0.1241 *7) msec = 2.0036 msec

LE Mode

DH Packet	Pulse	Number of	Average	Limit	Margin
	Width	Pulses in	Time of		-
	(msec)	1.6	(sec)	(sec)	(sec)
		seconds			
LE Mode	1.772	6	0.106	0.4	0.294

Page 89 of 153

PULSE WIDTH (On + Off Time)



OFF TIME



Page 90 of 153

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NUMBER OF PULSES IN 1.6 SECOND OBSERVATION PERIOD



Page 91 of 153

7.3.5. OUTPUT POWER

<u>LIMIT</u>

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	-0.92	30	-30.92
Middle	2440	-1.06	30	-31.06
High	2480	-1.12	30	-31.12

Page 92 of 153

OUTPUT POWER



Page 93 of 153



Page 94 of 153



Page 95 of 153

7.3.6. AVERAGE POWER

<u>LIMIT</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	-1.72
Middle	2440	-1.47
High	2480	-1.54

Page 96 of 153

7.3.7. CONDUCTED SPURIOUS EMISSIONS

<u>LIMITS</u>

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

Page 97 of 153

SPURIOUS EMISSIONS, LOW CHANNEL



Page 98 of 153



Page 99 of 153

SPURIOUS EMISSIONS, MID CHANNEL



Page 100 of 153



Page 101 of 153

SPURIOUS EMISSIONS, HIGH CHANNEL



Page 102 of 153



Page 103 of 153

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



Page 104 of 153



Page 105 of 153

8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range	Field Strength Limit	Field Strength Limit
(MHz)	(uV/m) at 3 m	(dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Page 106 of 153

8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

Agilent 14:44:53	Feb 9, 2011				K I	Freq/Channel
Ref120 dBµ∨ #Peak	#Atten 0 dB		N	lkr1 2.361 4 56.18	4 GHz dBµ∨	Center Freq 2.35000000 GHz
.og 0 B/						Start Freq 2.3100000 GHz
Offst 12.1 IB						Stop Freq 2.3900000 GHz
01 /4.0 ΙΒμ∀						CF Step 8 0000000 MHz
.gAv \$1 V2	han shekarara an da hakarara an an an an an	control in an lat	1	In-resolution and a second		Auto Ma
(f):		iteration in the second state		ale of the A- of the State of the State		0.00000000 Hz
Tun Swp						Signal Track On <u>Of</u>
Start 2.310 00 GHz	#VB	W 1 MHz	Sween 1 0	Stop 2.390 0 67 ms (2001	0 GHz	

Page 107 of 153

			0.000.00.011	
Ref120 dBµ∨ #Peak	#Atten 0 dB		2.389 08 GHZ 43.94 dBµ∨	Center Freq 2.35000000 GHz
_og 10				Start Fred
1B/ Offst				2.31000000 GHz
32.1 1B				Stop Freq
				2.3900000 GH2
iBµ∀				
_gAv				Auto Ma
S1 V2				Freq Offset
				T 0.00000000 Hz
×(f): =Tun				- Signal Track
Swp				0n
			2 200 00 CH-	Ļ
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Page 109 of 153

		ML-4	2 200 02 CU-	
Ref 120 dBµ∨ #Peak	#Atten 0 dB		43.58 dBµ∨	Center Freq 2.35000000 GHz
Log 10 dB/				Start Freq 2.31000000 GHz
32.1 1B				- Stop Freq 2.39000000 GHz
54.0 IBµ∨ _gAv				CF Step 8.00000000 MHz Auto Ma
S1 V2				Freq Offset 0.00000000 Hz
×(f):				Signal Track
Start 2.310 00 GHz		Stop	2.390 00 GHz	

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Page 111 of 153

-			Mind	2 404 204 00 CH	
Ref 120 dBµ∨ #Peek	#Atten 0 dB			2.494 291 00 GH 43.75 dB⊦	Center Freq 2.49175000 GHz
10 dB/					Start Freq
Offst					
32.4 dB					
DI					2.5000000 GH2
54.0 dBµ∨					CF Step
LgAv					Auto Ma
s1 v2					Erog Offcot
S3 FC			1		0.00000000 Hz
«m:			o		
FTun					Signal Track
Swp					
Start 2.483 500 00	GHz		Stop	2.500 000 00 GH	z
Res BW 1 MHz	#VF	W 10 Hz	Sween 1	287 s (2001 nts)	

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Page 113 of 153

			ML	2 404 027 00	CU-	1
Ref 120 dBµ∀	#Atten 0 dB		WIKT	2.494 027 00	Gnz IBµ∨	Center Freq 2.49175000 GHz
#Peak						
10 dB/						Start Freq 2.48350000 GHz
Offst						
32.4 dB						Stop Freq
dBu∀						CF Step
LaAv						1.6500000 MHz
Ŭ						
S1 V2						Freq Offset
S3 FC						0.00000000 Hz
«(f):		-	- `			
FTun						Signal Track
Swp						0n <u>01</u>
Start 2 483 500 00	GHz		Stop	2,500 000 00	GHz	

HARMONICS AND SPURIOUS EMISSIONS

Complia	High ance Ce	Frequency rtification	/ Measurem Services. Fr	ent emont	5m Cł	amber									
- опфия		- meanon		mont											
Compar Proiect	ıy: Hon #: 11J	Hai 13630													
Date: 02	2/10/11														
Fest En Configu	igineer: ration	Doug And FUT and U	erson SB Covnerts	er Con	necter	l to Sum	ort PC								
Mode: (Continu	ous Transı	nit / GFSK N	/Iodula	tion	r to supp									
Test Eo	uinmen	t:													
	orp 1	19647	Pre-ar	nnlifer	1.26	CH-7	Pre-am	nlifer	26-40.04		Но	vrn > 186	:H7		Limit
T59- 9	S/N+ 32/	5@3m	T145 A	ailent	3008.00	05(T TO-am	piner	20-4001		110		112		FCC 15.205
155, 5		, and	•	ignenit.	000A0					_				•	·
HiFred	quency Ca	bles					201	h	007500	1				Peal	Massuraments
3.0	cable 2	2807700	12°C	able 2	28070	500	20 Ca		.807500		нрь	Re	ject Filte	RB	W=VBW=1MHz
3' c	able 228	807700	▼ 12' ca	ble 228	07600	•	20' cab	le 2280	7500			• R_	001	• Avera	ge Measurements
								·							
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	dB	Amp dB	D Corr dB	Flfr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
	1/242	3 MIL-> (37													× /
LOW CHAN	unei (24U	2 winzj/ Ver	ucal:												
1.804	3.0	39.5	26.3	32.8	5.8	-34.8	0.0	0.0	43.2	30.0	74	54	-30.8	-24.0	V
Low Char	<u>mel (240</u>	2 MHz) / Hor	<u>izontal:</u>												
4.804	3.0	39.0	25.3	32.8	5.8	-34.8	0.0	0.0	42.7	29.0	74	54	-31.3	-25,0	H, Noise Floor
Mid Char	<u>inel (244</u>	l MHz)/Ver	tical:												
4.882	3.0	39.0	25.6	32.8	5.8	-34.9	0.0	0.0	42.8	29.4	74	54	-31.2	-24.6	v
Mid Char	<u>unel (244</u>	l MHz)/Hor	izontal:					ļ							
4.882	3.0	38.7	25.4	32.8	5.8	-34.9	0.0	0.0	42.5	29.2	74	54	-31.5	-24.8	H, Noise Floor
					ļ										
High Cha	unnel (24	<u>30 MHz) / Ve</u>	rtical:												
4.960	3.0	38.1	25.0	32.9	59	-34.9	0.0	0.0	42.0	28.9	74	54	-32.0	-25.1	V, Noise Floor
High Cl		20 MH-577-				-									
ingn Uffa		o MITZJ/ 110	LEURIAL:												
4.960	3.0	37.6	24.6	32.9	59	-34.9	0.0	0.0	41.5	28.5	74	54	-32.5	-25.5	H, Noise Floor
Petr 07 7	2 00														
	f	Measurem	ent Frequency	7		Amp	Preamp (Gain				Avg Lim	Average H	Field Strengt	h Limit
	Dist	Distance to	Antenna	,		D Corr	Distance	Corre	ct to 3 mete	ers		Pk Lim	Peak Fiel	d Strength Li	imit
	Read	Analyzer R	.eading			Avg	Average	Field S	trength @	3 m		Avg Mar	Margin vs	. Average Li	imit
	AF	Antenna Fa	actor			Peak	Calculate	d Peal	t Field Stre	ngth		Pk Mar	Margin vs	. Peak Limit	
	сь.	Capie Los:	•			ΠrΓ	ringu ir as	s ruter							

Page 115 of 153

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8.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

			Mkr1 2.383 40	GHz
f 120 dBµ∨ eak	#Atten 0 dB		56.67 d	Bµ∨ Center ⊢re 2.35000000 GH
g				Start Free 2.31000000 GH
1				Stop Fre 2.39000000 GH
0 μ∨ 4v				CF St 8.0000000 MH <u>Auto</u>
V2 FC	wywigingala kastalia i dawlad kwyd	helling second from the sound	Alata hadi ingina dani hispani dani	Freq Offse
:п ирп				Signal Trac
art 2.310 00 GHz			Stop 2.390 00	GHz

Page 116 of 153

			Mkr1 2.355 64 GHz	
Ref 120 dBµ∨ #Peak	#Atten 0 dB		43.00 dBµ∨	2.35000000 GHz
Log 10 dB/				Start Freq 2.31000000 GHz
32.1 1B				- Stop Freq 2.39000000 GHz
54.0 dBµ∨				CF Step 8.0000000 MHz
_gAv				<u>Auto Ma</u>
S1 V2		1		Freq Offset 0.00000000 Hz
«(f):		◇		Signal Track
Swp				
Start 2.310 00 GHz			Stop 2.390 00 GHz	

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Page 118 of 153

		Mkr1 2.356 20 GHz	
Ref 120 dBµ∨ #Peak	#Atten 0 dB	43.04 dBµ∀	2.35000000 GHz
Log 10 dB/ Offst			Start Freq 2.31000000 GHz
32.1 dB			- Stop Freq 2.3900000 GHz
01 54.0 dBµ∨			CF Step 8.00000000 MHz
-9 ⁰ "			Freq Offset
×(f):			Signal Track
Tun Swp			On Of
Start 2.310 00 GHz		Stop 2.390 00 GHz	

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Page 120 of 153

		Mba4 2	400 004 00 CU-	
Ref 120 dBµ∨ #Peak	#Atten 0 dB		43.60 dBµ∀	Center Freq 2.49175000 GHz
Log 10				Start Freq
dB/ Offst				2.48350000 GHz
32.4 dB				- Stop Freq 2.5000000 GHz
D1 54.0 dBµ∀				CF Step
LgAv				1.65000000 MHz Auto Ma
51 V2				Freq Offset
«(f):	<u> </u>			
Tun Swp				
Start 2.483 500 00	GHz	Stop 2	.500 000 00 GHz	

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Page 122 of 153

		Mbs4 2.4	04 400 50 CU-	1
Ref 120_dBµ∨	#Atten 0 dB	MKT1 2.4	43.90 dBµ∨	Center Freq
#Peak				2.10110000 0112
Log 10 JB/				Start Freq
Diffet				2.48350000 GHZ
32.4 1B				Stop Freq
01				2.50000000 GHZ
54.0 dBµ∨				CF Step
_gAv				Auto Ma
s1 v2				Erog Offent
33 FC				
		♦		0.00000000 112
«(f):				
Tun				
Swp				
Start 2 483 500 00	GHz	Stop 2.5	00 000 00 GHz	
Bas BW 1 MHz	#VBW	10 Hz Sween 1 28	7 e /2001 ntel	

HARMONICS AND SPURIOUS EMISSIONS

nderson I USB Covner I USB Covner I USB Covner I USB Covner I USB Covner I T145	er Com Iodulati Agilent 3 able 228 AF dB/m	nected ion 1-260 28076 07600	GHz 05(-	Pre-am	plifer ble 22	26-40GH	z •	Ho	rn > 18G	Hz	Ţ	Limit FCC 15.205
nderson USB Covner nsmit / 8PSK I Pre-a T145 00 12' c 2k Read Avg 7 dBuV Vertical:	er Com Iodulati mplifer Agilent 3 cable 2 able 228	uected ion 1-260 3008A0 28076 28076 007600	GHz 05(v 500	Pre-am 20' cal 20' cab	plifer ble 22	26-40GH	z	Но	rn > 18G	Hz	•	Limit FCC 15.205
nderson USB Covner asmit / 8PSK I Pre-a T145 10 12' c 2k Read Avg 7 dBuV Vertical:	er Com Iodulati mplifer Agilent 3 cable 2 able 228	nected ion 1-260 3008A0 28076 307600	GHz 05(v	Pre-am 20' cal 20' cab	ıplifer ble 22	26-40GH	z	Но	rn > 18G	Hz	Ţ	Limit FCC 15.205
nderson I USB Covner Issmit / 8PSK I Pre-a T145 10 12' c 2k Read Avg 7 dBuV Vertical:	er Com Iodulati mplifer Agilent 3 cable 2 able 228 AF dB/m	nected ion 1-260 3008A0 28076 07600	GHz 05(v 500	Pre-am 20' cal 20' cab	ıplifer ble 22	26-40GH	z	Ho	rn > 18G	Hz	•	Limit FCC 15.205
I USB Covner nsmit / 8P5K I Pre-a V T145 00 12' c 2k Read Avg 7 dBuV Vertical:	er Com Iodulati mplifer Agilent 3 cable 2 able 228 AF dB/m	nected ion 1-260 3008A0 28076 07600	GHz 05(v	Pre-am 20' cal 20' cab	ıplifer ble 22	26-40GH	z	Ho	rn > 18G	Hz	•	Limit FCC 15.205
Pre-a Pre-a Pre-a 12' c 2'k Read Avg 7 dBuV Vertical:	Agilent 3 able 228	1-260 3008A0 28076 07600	GHz 05(-	Pre-am 20' cal 20' cab	ıplifer ble 22	26-40GH	z	Ho	rn > 18G	Hz	•	Limit FCC 15.205
Pre-a T145	Agilent 3 cable 2 able 228 AF dB/m	- 1-260 3008A0 28076 07600	GHz 05(- 500	Pre-am 20' cal 20' cab	plifer ble 22	26-40GH	z •	Ho	rn > 18G	Hz	•	Limit FCC 15.205
Pre-a T145	Agilent 3 cable 2 able 228	1-260 3008A0 28076 07600	GHz 05(_ 500	Pre-am 20' cal 20' cab	ıplifer ble 22	26-40GH	z	Ho	rn > 18G	Hz	•	Limit FCC 15.205
Vertical:	Agilent 3 able 2 able 228 AF dB/m	8008A0 28076 07600 CL	05(-	20' cal 20' cab	ble 22	2807500					-	FCC 15.205
00 12' 0 12' c 12' c Pik Read Avg dBuV Vertical:	able 228	28076 07600 CL	500 •	20' cal 20' cab	ble 22	807500					•	
00 12' 0 12' c 7 dBuV Vertical:	able 22 able 228 AF dB/m	28076 07600 CL	500	20' ca 20' cab	ble 22	807500						
0 12' 0 12' c Pk Read Avg 7 dBuV Vertical:	able 228 Able 228 AF dB/m	28076 07600 CL	•	20' cal 20' cab	ble 22	807500						
Vertical:	able 228 AF dB/m	07600 CL	•	20' cab		.007.000		HPF	Re	iect Filte	r <u>Peal</u>	k Measurements
Pk Read Avg / dBuV // Vertical:	AF dB/m	07600 CL	•	20' cab		7500				,	RB	W=VBW=1MHz
Pk Read Avg dBuV Vertical:	AF dB/m	CL		,	le 2280	⁰⁷⁵⁰⁰			▼ R_	001	 Avera RBW= 	<u>ge Measurements</u> 1MHz : VBW=10Hz
Pk Read Avg <u>dBuV</u> <u>Vertical:</u>	AF dB/m	CL					<u> </u>		,			
/ dBuV Vertical:	dB/m		Amp	D Corr	Fltr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
Vertical:		dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
26.2	32.8	5.8	-34.8	 	٦U	43.5	29.9	74	54	-30.5	-24.1	v
												·
lorizontal:												
25.2	22.0	60	24.0		0.0	12.5	28.0		= 1	21.5	25.1	II N-i El
25.2	32.8	8.6	-34.0	0.0	0.0	425	28.9	74	24	-31.2	-25.1	H, NOISE FIGOF
									1			
<u>/ertical:</u>												
25.2	32.8	5.8	-34.9	0.0	0.0	43.1	29.0	74	54	-30.9	- 25.0	v
<u>Iorizontal:</u>												
24.9	32.8	5.8	-34.9	0.0	0.0	42.3	28.7	74	54	-31.7	-25.3	H. Noise Floor
							2011		5.			
Vertical:												
24.9	32.9	59	-34.9	0.0	0.0	42.1	28.8	74	54	-31.9	-25.2	V, Noise Floor
<u>Horizontal:</u>					ļ							
24.6	32.9	5.9	-34.9	0.0	0.0	42.0	28.6	74	54	-32.0	-25.4	H, Noise Floor
	1	1]	1	1							
3 3 //	Horizontal: 8 25.2 Vertical: 3 3 25.2 Horizontal: 5 5 24.9 /Vertical: 2 2 24.9 /Horizontal: 1	Horizontal: 8 25.2 32.8 Vertical: 3 25.2 32.8 Horizontal: 5 24.9 32.8 /Vertical: 2 24.9 32.9 /Horizontal: 1 24.6 32.9	Horizontal: 1 8 25.2 32.8 5.8 Vertical: 3 25.2 32.8 5.8 Horizontal: 5 24.9 32.8 5.8 /Vertical: 2 24.9 32.9 5.9 /Horizontal: 1 24.6 32.9 5.9	Horizontal: 1 8 25.2 32.8 5.8 .34.8 Vertical:	Horizontal: 1 8 25.2 32.8 5.8 -34.8 0.0 Vertical:	Horizontal: 1 8 25.2 32.8 5.8 -34.8 0.0 0.0 Vertical: - - - - - 3 25.2 32.8 5.8 -34.9 0.0 0.0 Horizontal: - - - - - 5 24.9 32.8 5.8 -34.9 0.0 0.0 /Vertical: - - - - - 2 24.9 32.9 5.9 -34.9 0.0 0.0 //Horizontal: - - - - - 1 24.6 32.9 5.9 -34.9 0.0 0.0	Horizontal: 32.8 5.8 -34.8 0.0 0.0 42.5 Wertical: - - - - - 3 25.2 32.8 5.8 -34.9 0.0 0.0 43.1 Horizontal: - - - - - - 2 24.9 32.9 5.9 -34.9 0.0 0.0 42.1 /Horizontal: - - - - - - 1 24.6 32.9 5.9 -34.9 0.0 0.0 42.0	Horizontal: Image: Constraint of the second sec	Horizontal: 3 25.2 32.8 5.8 -34.8 0.0 0.0 42.5 28.9 74 Wertical:	Horizontal: 32 25.2 32.8 5.8 .34.9 0.0 0.0 42.5 28.9 74 54 Wertical: - - - - - - - - 3 25.2 32.8 5.8 .34.9 0.0 0.0 43.1 29.0 74 54 Horizontal: 5 24.9 32.8 5.8 .34.9 0.0 0.0 42.3 28.7 74 54 /Vertical: - - - - - - - - 2 24.9 32.9 5.9 .34.9 0.0 0.0 42.1 28.8 74 54 /Vertical: 7 24.9 32.9 5.9 .34.9 0.0 0.0 42.1 28.8 74 54 /Horizontal: - - - - - - - 1 24.6 32.9 5.9 .34.9 0.0 0.0 42.0 28.6 74 54	Horizontal: 3 25.2 32.8 5.8 -34.8 0.0 0.0 42.5 28.9 74 54 -31.5 Vertical:	Horizontal: 32 25.2 32.8 5.8 .34.9 0.0 0.0 42.5 28.9 74 54 .31.5 .25.1 Vertical:

Page 124 of 153

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8.2.3. LE GFSK MODE

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

Agrient 14.05.00	16024,2011			КТ	
ef 120 dBµ∨ Peak	#Atten 0 dB		Mkr1 3	2.367 87 GHz 55.92 dBµ∨	Center Freq 2.35000000 GHz
9g					Start Freq 2.31000000 GHz
1st .9 3					Stop Frec 2.3900000 GHz
.0 3μV Av					CF Ste 8.0000000 MHz Auto M
V2 FC	and all the second states and the	Mahammana	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	mmillitation	Freq Offset 0.00000000 Hz
): Tun vp					Signal Track On <u>O</u>
art 2.310 00 GHz Res BW 1 MHz	#VBW 1		Stop 2 Sweep 1	2.390 00 GHz ms (601 pts)	

Page 125 of 153

		NII 4 0 000 00 CI	
Ref 120 dBµ∨ #Pook	#Atten 0 dB	42.91 dB _µ	Center Freq 2.35000000 GHz
10 dB/			Start Freq 2.31000000 GHz
Offst			
dB			
			2.39000000 GH2
54.0 dBµ∀			CF Step
LgAv			Auto Ma
s1 v2			
S3 FC			
×(f):			
FTun			Signal Track
Swp			
Start 2.310 00 GHz	<u> </u>	Stop 2.390 00 GF	
#Res BW 1 MHz	#VBW 10 F	z Sweep 6.238 s (601 pts)	

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Page 127 of 153

A Agricity 14.00.	47 16024,2011		Frequenanner
Ref 120 dBµ∨ #Peak	#Atten 0 dB	Mkr1 2.388 93 44.68	B GHz dBµ∨ Center Freq 2.35000000 GHz
Log 10 dB/			Start Freq 2.31000000 GHz
31.9 4B			Stop Fred 2.39000000 GHz
54.0 1Bµ√ gAv			CF Ste 8.00000000 MHz
51 V2			Freq Offset
*(f): =Tun Swp			Signal Track
Start 2.310 00 GHz	#\/BW 10	Stop 2.390 00) GHz

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Page 129 of 153

		Mind 1	101 115 0 CU-	<u>المحمد المحمد المحم</u>
Ref120 dBµ∨ #Peak	#Atten 0 dB		44.55 dBµ∨	Center Freq 2.49175000 GHz
Log 10				Start Fred
dB/ Offst				2.48350000 GHz
32.2 dB				Stop Freq 2.5000000 GHz
DI 54.0 dBµ∀				CF Step
_gAv				1.65000000 MHz <u>Auto Ma</u>
51 V2				Freq Offset
«(f):		 		
=Tun Swp				On <u>Off</u>
			500.000.0 CH-	

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Page 131 of 153

	40 1 60 24, 2011			IX 1	
Project: Ref 120 dBµ∨ #Peak	#Atten 0 dB		Mkr1 2	2.494 527 5 GHz 44.61 dBµ∨	Center Freq 2.49175000 GHz
dB/					Start Freq 2.48350000 GHz
32.2 dB					Stop Freq 2.5000000 GHz
54.0 dBµ∨					CF Step 1.6500000 MHz
_gAv 51 V2					Auto Ma Freq Offset
S3 FC			1		0.00000000 Hz
=Ťun Swp					Signal Track On <u>Of</u>
Start 2.483 500 0 € #Res BW 1 MHz	GHz #VBW	10 Hz	Stop 2		

HARMONICS AND SPURIOUS EMISSIONS

omplia	High nce Ce	Frequency rtification	⁷ Measurem Services, Fr	ent emont :	5m Cł	ıamber									
ompan	y:		HON HAI												
roject #	¥:		11J13630												
ate:	-		2/24/11												
'onfigur	ation:		EUT and the re	emote su	n poort L	aptop									
Iode:			TX LE GFSK												
est Eou	uinmen	t.													
Н	orn 1-	18GHz	Pre-an	nplifer	1-26	GHz	Pre-am	plifer	26-40GH	z	Ho	orn > 18G	Hz		Limit
T60; S	/N: 223	8 @3m	T145 A	gilent3	008A0	056 🖵				-				-	FCC 15.209 🖵
- Hi Fred	uency Ca	blec													
3' c	able 2	2807700	12' c	able 2	28076	500	20' cal	ole 22	807500		HPF	Re	ject Filte	r <u>Peak</u>	<u>: Measurements</u> W=VBW=1MHz
3' ca	able 228	807700	- 12' ca	ble 228	07600	•	20' cab	le 2280	7500 -			• R_	001	 <u>Avera</u> RBW= 	ge Measurements 1MHz; VBW=10Hz
	Diet	D J Dl.	DeelArre	ΔE	CT		D.C.	1714-	Deals		Dl. T.i	A	DI- M	Arra Mara	N
I GH7	(m)	dBnV	dBuV	Ar dB/m		dB	dB	dB	reak dBuV/m	Avg dBuV/m	rk Lin dBuV/m	dBuV/m	rk Mar dB	dB	(V/H)
ow Ch	(111)		and a start	ull/III					abavin	abuvin	abavan	abuvnu			(7/1)
300	3.0	54.9	34.2	25.5	2.7	-35.9	0.0	0.0	47.2	26.5	74	54	- 26.8	-27.5	V
413	3.0	51.4	37.9	28.1	39	-35.1	0.0	0.0	48.2	34.7	74	54	-25.8	-19.3	V
320 131	3.0		319	30.4	4.0 5.2	-35.1	0.0	0.0	53./ 51.1	37.8	74 74		-20.3	-10.2 -16.2	γ γ
205	3.0	51.4	38.3	25.2	2.6	-36.0	0.0	0.0	43.1	30.1	74	54	-30.9	-23.9	H
515	3.0	50.3	37.7	26.2	3.0	-35.8	0.0	0.0	43.7	31.1	74	54	-30.3	-22.9	H
312 ia Ch	3.0	50.2	36.1	30,4	4.0	-35.1	UU	ບມ	50.2	36.1	74	54	-23.8	-17.9	Н
250	3.0	54.3	34.7	25.3	2.7	-36.0	0.0	0.0	46.3	26.7	74	54	-27.7	-27.3	v
767	3.0	51.2	38.3	27.0	3.2	-35.6	0.0	0.0	45.9	33.0	74	54	- 28.1	- 21.0	V
308	3.0	53.2	37.6	30.4	4.6	-35.1	0.0	0.0	53.1	37.5	74	54	-20.9	-16.5	V
817	3.0	48.4	33.3	32.7	5.8	-34.8	0.0	0.0	52.0	36.9	74	54	-22.0	-17.1	V
315	3.0	48.6	35.3	30.4	4.6	-35.1	0.0	0.0	48.5	35.2	74	54	-25.5	-18.8	H
gh Ch															
010	3.0	55.0	35.7	24.5	2.4	-36.1	0.0	0.0	45.7	26.4	74	54	-28.3	- 27.6	v
295	3.0	58.9	37.0	25.5	2.7	-35.9	0.0	0.0	51.1	29.2	74	54	-22.9	-24.8	V
910 195	3.0	49./	30.7 30.2	20.2	4.4	-35.8	0.0 0.0	0.0 0.0	43.1 46.4	29.4	74		-30.9	-24.0	ν ν
205	3.0	47.5	31.3	30.2	4.5	-35.1	0.0	0.0	47.0	30.8	74	54	-27.0	-23.2	v
030	3.0	44.O	30.2	32.1	5.2	-34.7	0.0	0.0	46.5	32.7	74	54	-27.5	- 21.3	V
567	3.0	48.7	35.3	26.7	3.1	-35.6	0.0	0.0	42.9	29.4	74	54	-31.1	-24.6	H
					•										
.v. 07.22.	.09														
	f	Measurem	ent Frequency	7		Amp	Preamp (Gain				Avg Lim	Average F	ield Strengtl	n Limit
	Dist	Distance to	Antenna			$\mathbb{D} \ \mathbb{C} \text{orr}$	Distance	Correc	ct to 3 mete	rs		Pk Lim	Peak Field	l Strength Li	mit
	Read	Analyzer R	eading			Avg	Average	Field S	strength @	3 m		Avg Mar	Margin vs	Average Li	mit
	AF	Antenna Fa	actor			Peak	Calculate	d Peał	r Field Stre	ngth		Pk Mar	Margin vs	Peak Limit	
	CL	Cable Loss	1			HPF	High Pas	s Filter							

Page 133 of 153

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8.3. RECEIVER ABOVE 1 GHz

Compliar		1 .	measuren	lem											
	ice Ce	rtification	Services, Fr	emont	5m Ch	amber									
ompany	: Hon	Hai													
roject #	: 11JI	13630													
ate: 02/	10/11	37-1 D441													
est Eng onfigura	ntion:	EUT and U	sian SB Covnert	er Con	nected	to Supr	ort PC								
Iode: R	X / 8P	SK Modula	tion												
est Equ	ipmen	t:													
		40.011-	Bro. et	a n life i	4.06/	211-	Dra am	nlifer	26 40 CH	_	LI.		-LI-		Limit
по	in i-	16662	Fie-ai	npinei	1-200	512	Fie-am	piner	20-4001	<u> </u>	п	JII > 186			Ennix
T59; S/	N: 324	5 @3m	• T145 A	Agilent	3008A0	056				-				-	FCC Class B
- Hi Frequ	iency Cal	bles													
3' ca	able 2	2807700	12' c	able 2	28076	600	20' ca	ble 22	807500		HPF	Re	ject Filte	r Peak	Measurements
3' ca	ble 228	307700	12' ca	nble 228	07600		20' cab	le 2280	7500 _			- R	001	Avera	ge Measurements
						•			•					RBW=	IMHz; VBW=10Hz
f	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Сон	Fltr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
	1 (0 ()														
lid Chann	el (244	I MHz)/ Ver	<u>bcal:</u>												
257	3.0	51.3	49.1	30.6	4.6	-35.1	0.0	0.0	51.3	49.1	74	54	-22.7	-4.9	<u>v</u>
.161	3.0	52.5	35./	30.7 24.5	4.0	-35.1 -36.0	0.0	0.0	52.7 46.5	35.9 21.9	74	54 54	-21.3	-18.1 -32.1	v
.205	3.0	50.A	35.9	24.7	2.6	-36.0	0.0	0.0	41.7	27.2	74	54	-32.3	-26.8	v
.760	3.0	46.9	28.0	26.7	3.2	-35.6	0.0	0.0	41.2	22.4	74	54	-32.8	-31.6	<u>v</u>
.607	3.0	52.6	32.7	26.2	3.1	-35.7	0.0	0.0	46.2	26.2	74	54	-27.8	-27.8	V
.010			27.0					0.0							•
lid Chann	el (244	l MHz)/Hori	izontal:												
257	30	49.6	467	30.6	46	-35 1	0.0	0.0	49.6	467	74	54	-24.4	.73	н
.208	3.0	49.0	32.5	24.7	2.6	-36.0	0.0	0.0	40.3	23.8	74	54	-33.7	-30.2	H
314	3.0	49.7	33.9	30.7	4.6	-35.1	0.0	0.0	49.9	34.1	74	54	- 24.1	- 19.9	Н
.609	3.0	49.0	32.7	26.2	3.1	-35.7	0.0	0.0	42.5	26.2	74	54	-31.5	-27.8	H
.500	3.0	44.9	32.8	25.8	2.9	-35.8	0.0	0.0	37.8	25.7	74	54	-36.2	-28.3	Н
								ļ						l	
ev. 07.22.0	09														
	f	Measureme	ent Frequenc	v		Amp	Preamp (Gain				Avg Lim	Average H	Field Strength	Limit
	_ Dist	Distance to	Antenna	,		D Corr	Distance	Correc	ct to 3 mete	rs		Pk Lim	Peak Fiel	d Strength Li	mit
	Read	Analyzer R	eading			Avg	Average	Field S	strength @	3 m		Avg Mar	Margin vs	Average Li	mit
	AF	Antenna Fa	actor			Peak	Calculate	d Peak	Field Stre	ngth		Pk Mar	Margin vs	. Peak Limit	
	CL	Cable Loss	3			HPF	High Pas	s Filter					-		

Page 134 of 153

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8.4. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

Compliar	ice Certif	fication Se	rvices, Fi	emoni	5m Cha	mber							
Test Engr	: Vahan H	Pilibosian											
Date: 02/]	10/2011												
Project #:	11J1360												
Company	: Hon Ho	i											
fest Targe	et: EUT a	nd USB Co	wnerter	Conne	cted to S	upport P	С						
Mode Ope	er: TX_W	orst Case											
	f	Measurem	ent Fremu	nev	Amn	Preamp G	lain			Marrin	Marrin vs	Limit	
	Dist	Distance t	o Antonn		D Corr	Distance	Correct						
								to a meters					
	Read	Analyzer l	o mileiu. Reading	-	Filter	Filter Inse	ert Loss	to 5 meters					
	Read AF	Analyzer I Antenna F	Continent Reading Pactor	-	Filter Corr.	Filter Inse Calculated	ert Loss I Field S	to 5 meters					
	Read AF CL	Analyzer I Antenna F Cable Loss	eading Pactor	-	Filter Corr. Limit	Filter Inse Calculated Field Strey	ert Loss I Field S neth Lin	trength nit					
	Read AF CL	Analyzer I Antenna F Cable Loss	Reading Tactor ;	-	Filter Corr. Limit	Filter Inse Calculated Field Stree	ert Loss 1 Field S ngth Lii	to 5 meters trength mit					
f	Read AF CL Dist	Analyzer I Antenna F Cable Loss Read	Reading Factor	CL	Filter Corr. Limit	Filter Inse Calculated Field Stree	ert Loss I Field S ngth Lii Pad	trength mit	Limit	Margin	Ant Pol	Det	Notes
f MHz	Read AF CL Dist (m)	Analyzer I Antenna F Cable Loss Read dBuV	AF dB/m	CL dB	Filter Corr. Limit Amp dB	Filter Inse Calculated Field Stree D Corr dB	ert Loss I Field S ngth Liv Pad dB	trength mit Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
f MHz 31.56	Ead AF CL Dist (m) 3.0	Analyzer I Antenna F Cable Loss Read dBuV 35.1	AF dB/m 19.6	CL dB 0.5	Filter Corr. Limit dB 29.7	Filter Inse Calculated Field Stree D Corr dB 0.0	ert Loss I Field S ngth Lin Pad dB 0.0	Corr. dBuV/m 25.5	Limit dBuV/m 40.0	Margin dB -14.5	Ant. Pol. V/H H	Det. P/A/QP	Notes
f MHz 31.56 52.681	Read AF CL (m) 3.0 3.0	Analyzer I Antenna F Cable Loss Read dBuV 35.1 51.1	AF dB/m 7.9	CL dB 0.5 0.6	Filter Corr. Limit Amp dB 29.7 29.6	Filter Inse Calculated Field Stree D Corr dB 0.0 0.0	ert Loss I Field S ngth Lin Pad dB 0.0 0.0	trength mit Corr. dBuV/m 25.5 30.1	Limit dBuV/m 40.0 40.0	Margin dB -14.5 -9.9	Ant. Pol. V/H H H	Det. P/A/QP P	Notes
f MHz 31.56 52.681 226.448	Read AF CL (m) 3.0 3.0 3.0 3.0	Analyzer I Antenna F Cable Loss Read dBuV 35.1 51.1 51.5	AF dB/m 19.6 7.9 11.9	CL dB 0.5 0.6 1.4	Filter Corr. Limit dB 29.7 29.6 28.8	Filter Inse Calculated Field Stree D Corr dB 0.0 0.0 0.0 0.0	Pad dB 0.0 0.0 0.0	trength mit Corr. dBuV/m 25.5 30.1 35.9	Limit dBuV/m 40.0 40.0 46.0	Margin dB -14.5 -9.9 -10.1	Ant Pol V/H H H	Det. P/A/QP P P P	Notes
f MHz 31.56 52.681 226.448 301.331	Read AF CL (m) 3.0 3.0 3.0 3.0 3.0	Analyzer I Antenna F Cable Loss Read dBuV 35.1 51.1 51.5 49.6	AF dB/m 19.6 7.9 11.9 13.3	CL dB 0.5 0.6 1.4 1.6	Filter Corr. Limit 29.7 29.6 28.8 28.8	Filter Inse Calculated Field Strep D Corr dB 0.0 0.0 0.0 0.0 0.0	ert Loss I Field S ngth Lin Pad dB 0.0 0.0 0.0 0.0 0.0	trength mit Corr. dBuV/m 25.5 30.1 35.9 35.7	Limit dBuV/m 40.0 40.0 46.0 46.0	Margin dB -14.5 -9.9 -10.1 -10.3	Ant Pol V/H H H H H	Det. P/A/QP P P P P	Notes
f MHz 31.56 52.681 226.448 301.331 323.172	Read AF CL (m) 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	Analyzer I Antenna F Cable Loss Read dBuV 35.1 51.1 51.5 49.6 47.7	AF dB/m 19.6 7.9 11.9 13.3 13.7	CL dB 0.5 0.6 1.4 1.6 1.7	Filter Corr. Limit 29.7 29.6 28.8 28.8 28.8 28.9	Filter Inse Calculated Field Strep D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0	ert Loss I Field S ngth Lin Pad dB 0.0 0.0 0.0 0.0 0.0 0.0	trength mit Corr. dBuV/m 25.5 35.9 35.7 34.1	Limit dBuV/m 40.0 40.0 46.0 46.0 46.0	Margin dB -14.5 -9.9 -10.1 -10.3 -11.9	Ant Pol V/H H H H H H	Det. P/A/QP P P P P P P P	Notes
f MHz 31.56 52.681 226.448 301.331 323.172 345.373	Read AF CL Dist (m) 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	Analyzer 1 Antenna F Cable Loss Read dBuV 35.1 51.1 51.5 49.6 47.7 48.5	AF dB/m 19.6 7.9 11.9 13.3 13.7 14.1	CL dB 0.5 0.6 1.4 1.6 1.7 1.7	Filter Corr. Limit 29.7 29.6 28.8 28.8 28.8 28.9 29.0	Filter Inse Calculated Field Stree D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.00 0.00000000000000	ert Loss I Field S ngth Lin Pad dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Corr. dBuV/m 25.5 30.1 35.9 35.7 34.1 35.2	Limit dBuV/m 40.0 46.0 46.0 46.0 46.0	Margin dB -14.5 -9.9 -10.1 -10.3 -11.9 -10.8	Ant Pol V/H H H H H H H	Det. P/A/QP P P P P P P	Notes
f MHz 31.56 52.681 226.448 301.331 323.172 345.373 502.664	Read AF CL 0ist (m) 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	Analyzer 1 Antenna F Cable Loss Read dBuV 35.1 51.5 49.6 47.7 48.5 41.4	AF dB/m 19.6 7.9 11.9 13.3 13.7 14.1 18.3	CL dB 0.5 0.6 1.4 1.6 1.7 1.7 2.4	Filter Corr. Limit Amp dB 29.7 29.6 28.8 28.8 28.8 28.9 29.0 29.6	Dilter Inse Calculated Field Street D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	ert Loss I Field S ngth Lin Pad dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Corr. dBuV/m 25.5 30.1 35.9 35.7 34.1 35.2 32.4	Limit dBuV/m 40.0 46.0 46.0 46.0 46.0 46.0	Margin dB -14.5 -9.9 -10.1 -10.3 -11.9 -10.8 -13.6	Ant Pol V/H H H H H H H H H	Det P/A/QP P P P P P P P P	Notes
f MHz 31.56 52.681 226.448 301.331 323.172 345.373 502.664 803.072	Read AF CL 01st (m) 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	Analyzer I Antenna F Cable Loss Read dBuV 35.1 51.5 49.6 47.7 48.5 41.4 41.9	AF actor AF dB/m 19.6 7.9 11.9 13.3 13.7 13.7 14.1 18.3 21.0	CL dB 0.5 0.6 1.4 1.6 1.7 1.7 2.4 2.8	Filter Corr. Limit Amp dB 29.7 29.6 28.8 28.9 29.0 29.6 29.1	Diter Inse Calculated Field Street D Corr dB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	ert Loss 1 Field S ngth Lin Pad <u>4B</u> 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Corr. dBuV/m 25.5 36.1 35.9 35.7 34.1 35.2 32.4 36.6	Limit dBuV/m 40.0 46.0 46.0 46.0 46.0 46.0 46.0	Margin dB -14.5 -9.9 -10.1 -10.3 -11.9 -10.8 -13.6 -9.4	Ant Pol V/H H H H H H H H H H H	Det P/A/QP P P P P P P P P P P	Notes

Page 135 of 153

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

ahan P 2011 J1360 Ion Ho EUT az TX_Wo f	ilibosian i nd USB Co orst Case	wnerter	Conne	cted to S	5upport P	с						
2011 IJ1360 Ion Hoi EUT au TX_Wo f	i nd USB Co orst Case	wnerier	Conne	ected to S	Support P	с						
IJ1360 Ion Hoi EUT au TX_Wo f	i nd USB Co orst Case	wnerter	Conne	cted to \$	Support P	с						
Ion Ho: EUT au TX_Wo f	i nd USB Co orst Case	wnerter	Conne	cted to S	Support P	с						
EUT au TX_Wo f	nd USB Co orst Case	wnerter	Conne	cted to \$	Support P	С						
IX_Wo	orst Case											
f												
f												
	Measurem	ent Frequ	ency	Amp	Preamp (Gain			Margin	Margin vs.	Limit	
Dist	Distance t	o Antenr	ıa	D Corr	Distance	Correct	to 3 meters					
Read	Analyzer l	Reading		Filter	Filter Ins	ert Loss						
AF	Antenna H	^r actor		Corr.	Calculate	d Field S	trength					
CL	Cable Los:	;		Limit	Field Stre	ngth Li	mit					
Diet	Read	AF	CL	Amn	DCorr	Pad	Corr	Limit	Margin	Ant Pol	Det.	Notes
(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/OP	110120
3.0	50.3	11.9	1.4	28.8	0.0	0.0	34.8	46.0	-11.2	v	P	
3.0	46.9	13.3	1.6	28.8	0.0	0.0	33.1	46.0	-13.0	V	P	
3.0	41.4	21.0	2.8	29.1	0.0	0.0	36.1	46.0	-9.9	V	Р	
3.0	38.9	21.6	3.0	28.6	0.0	0.0	34.9	46.0	-11.1	V	P	
	2001 2011 2011 2011 2011 2011 2011 2011	Distance 1 Distance 1 lead Analyzer 1 IF Antenna J L Cable Los: Dist Read (m) dBuV 3.0 50.3 3.0 46.9 3.0 41.4	Distance to Antenna lead Analyzer Reading F Antenna Factor Z Cable Loss Dist Read AF (m) dBuV dB/m 3.0 50.3 11.9 3.0 41.4 21.0 2.0 2.0 2.0	Distance to Antenna lead Analyzer Reading F Antenna Factor ZL Cable Loss Dist Read AF CL (m) dBuV dB/m dB 3.0 50.3 11.9 1.4 3.0 46.9 13.3 1.6 3.0 41.4 21.0 2.8	Distance to Antenna D contribution Analyzer Reading Filter F Antenna Factor Corr. ZL Cable Loss Limit Dist Read AF CL Amp (m) dBuV dB/m dB dB 3.0 50.3 11.9 1.4 28.8 3.0 46.9 13.3 1.6 28.8 3.0 41.4 21.0 2.8 29.1	Distance of Arlenna D'O'II Distance of Arlenna lead Analyzer Reading Filter Fi	Distance to Antenna Distance Correction lead Analyzer Reading Filter Fi Antenna Factor Corr. Cable Loss Limit Field Strength Lin Dist Read AF CL Amp D Corr Question dB/m dB dB dB 3.0 50.3 11.9 1.4 28.8 0.0 0.0 3.0 46.9 13.3 1.6 28.8 0.0 0.0 3.0 41.4 21.0 2.8 29.1 0.0 0.0	Bit and e to Antenna D'off Distance confect to Sincers dead Analyzer Reading Filter Filter Insert Loss IF Antenna Factor Corr. Calculated Field Strength ZL Cable Loss Limit Field Strength Limit Dist Read AF CL Amp D Corr Pad Corr. (m) dBuV dB/m dB dB dB dB uV/m 3.0 50.3 11.9 1.4 28.8 0.0 0.0 33.1 3.0 46.9 13.3 1.6 28.8 0.0 0.0 36.1 3.0 41.4 21.0 2.8 29.1 0.0 0.0 36.1	Bit and e to Antenna D'off D'stance correct to 3 meters lead Analyzer Reading Filter Filter Insert Loss F Antenna Factor Corr. Calculated Field Strength ZL Cable Loss Limit Field Strength Limit Dist Read AF CL Amp D Corr Pad Corr. Limit 0 50.3 11.9 1.4 28.8 0.0 0.0 34.8 46.0 3.0 46.9 13.3 1.6 28.8 0.0 0.0 36.1 46.0 3.0 41.4 21.0 2.8 29.1 0.0 0.0 36.1 46.0	Bit Ander to Antenna D Conf Distance Correct to 5 meters ad Analyzer Reading Filter Filter Insert Loss F Antenna Factor Corr. Calculated Field Strength ZL Cable Loss Limit Field Strength Limit Dist Read AF CL Amp D Corr Pad Corr. Limit 0ist Read AF CL Amp D Corr Pad BuV/m dBuV/m dB 3.0 50.3 11.9 1.4 28.8 0.0 0.0 34.8 46.0 -11.2 3.0 46.9 13.3 1.6 28.8 0.0 0.0 36.1 46.0 -9.9 3.0 41.4 21.0 2.8 29.1 0.0 0.0 36.1 46.0 -9.9	Distance is Definited and analyzer Reading Differ Differ <thdiffer< th=""></thdiffer<>	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

Page 136 of 153

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted	Limit (dBuV)
	Quasi-peak	Average
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.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

Page 137 of 153

Т

6 WORST EMISSIONS

	CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.		Reading		Closs	Limit	FCC_B	Marg	;in	Remark	
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV(dB)	L1/L2	
0.20	54.28		30.38	0.00	63.53	53.53	-9.25	-23.15	L1	
14.29	50.54		38.54	0.00	60.00	50.00	-9.46	-11.46	L1	
24.01	44.73		24.97	0.00	60.00	50.00	-15.27	-25.03	L1	
0.20	51.66		31.36	0.00	63.53	53.53	-11.87	-22.17	L2	
14.29	48.05		37.48	0.00	60.00	50.00	-11.95	-12.52	L2	
24.01	43.34		33.79	0.00	60.00	50.00	-16.66	-16.21	L2	
6 Worst I	Data									

Page 138 of 153

LINE 1 RESULTS



Page 139 of 153

LINE 2 RESULTS



Page 140 of 153

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MAXIMUM PERMISSIBLE EXPOSURE 10.

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Lin	nits for Occupational	I/Controlled Exposu	res	
0.3–3.0 3.0–30 30–300 300–1500 1500–100,000	614 1842/f 61.4	1.63 4.89/f 0.163	*(100) *(900/f²) 1.0 f/300 5	6 6 6 6
(B) Limits	for General Populati	ion/Uncontrolled Exp	posure	
0.3–1.34 1.34–30	614 824 <i>/</i> f	1.63 2.19/f	*(100) *(180/f ²)	30 30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

TABLE 1-LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)-Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
30–300 300–1500 1500–100,000		0.073	0.2 f/1500 1.0	30 30 30

f = frequency in MHz

f = frequency in MHz
 * = Plane-wave equivalent power density
 NOTE 1 To TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure.
 Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled is made aware of the potential for exposure.
 NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Page 141 of 153

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IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5

Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/f	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042f ^{0.5}	f/150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 /f ^{1.2}
150 000-300 000	0.158f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616 000 /f ^{1.2}

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.

- A power density of 10 W/m² is equivalent to 1 mW/cm².
- A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

Page 142 of 153

EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m² EIRP = Equivalent Isotropic Radiated Power in W D = Separation distance in m

Power density in units of W/m² is converted to units of mWc/m² by dividing by 10.

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

Band	Mode	Separation	Output	Antenna	IC Power	FCC Power
		Distance	Power	Gain	Density	Density
		(m)	(dBm)	(dBi)	(W/m^2)	(mW/cm^2)
2.4 GHz	Bluetooth	0.20	4.46	2.91	0.01	0.001

Page 143 of 153