

## FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-247 ISSUE 1

CERTIFICATION TEST REPORT For

**Dolphin CT50** 

MODEL NUMBER: CT50L0N FCC ID: HD5-CT50L0N IC ID: 1693B-CT50L0N

REPORT NUMBER: 15U20259-E8 ISSUE DATE: JUNE 05, 2015

Prepared for HONEYWELL INTERNATIONAL INC HONEYWELL SCANNING & MOBILITY 9680 OLD BAILES ROAD FORT MILL, SOUTH CAROLINA 29715, USA

> Prepared by UL VERIFICATION SERVICES INC. 47173 BENICIA STREET FREMONT, CA 94538, U.S.A. TEL: (510) 771-1000 FAX: (510) 661-0888



NVLAP LAB CODE 200065-0

### **Revision History**

Rev.	lssue Date		
	06/05/15	Initial Issue	C.S.OOI

Page 2 of 99

# TABLE OF CONTENTS

1.	AT	TESTATION OF TEST RESULTS	5
2.	TES	ST METHODOLOGY	6
3.	FAG	CILITIES AND ACCREDITATION	6
4.	CAI	LIBRATION AND UNCERTAINTY	6
4	.1.	MEASURING INSTRUMENT CALIBRATION	6
4	.2.	SAMPLE CALCULATION	6
4	.3.	MEASUREMENT UNCERTAINTY	6
5.	EQ	UIPMENT UNDER TEST	7
5	.1.	DESCRIPTION OF EUT	7
5	.2.	MAXIMUM OUTPUT POWER	7
5	.3.	DESCRIPTION OF AVAILABLE ANTENNAS	7
5	.4.	SOFTWARE AND FIRMWARE	7
5	.5.	WORST-CASE CONFIGURATION AND MODE	7
5	.6.	DESCRIPTION OF TEST SETUP	8
6.	TES	ST AND MEASUREMENT EQUIPMENT10	0
-			
7.	SUI	MMARY TABLE1	1
8.	AN	TENNA PORT TEST RESULTS12	
8	.1.	20 dB AND 99% BANDWIDTH	
	8.1. 8.1.		
	8.1.		
8	.2.	HOPPING FREQUENCY SEPARATION	5
8	.3.	NUMBER OF HOPPING CHANNELS	7
8	.4.	AVERAGE TIME OF OCCUPANCY	2
8	.5.	OUTPUT POWER	
	8.5.		
	8.5. 8.5.		
Q	.6.	AVERAGE POWER	
0	. <i>0.</i> 8.6.		
	8.6.	2. DATA RATE PI/4-DQPSK MODULATION46	6
	8.6.	3. ENHANCED DATA RATE 8PSK MODULATION47	7
8	.7.	CONDUCTED SPURIOUS EMISSIONS	
	8.7. 8.7.		
9.	RAI	DIATED TEST RESULTS	5
UL	VERI	Page 3 of 99 FICATION SERVICES INC. FORM NO: CCSUP4701	T
471	73 BE	ENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-088 rt shall not be reproduced except in full, without the written approval of UL Verification Services Inc.	

#### REPORT NO: 15U20259-E8 DATE: JUNE 05, 2015 IC ID:1693B-CT50L0N FCC ID: HD5-CT50L0N 9.1. 9.2. 9.2.1. ENHANCED DATA RATE 8PSK MODULATION ......79 9.2.2. WORST-CASE BELOW 1 GHz......92 9.3. 10. 11.

Page 4 of 99

## **1. ATTESTATION OF TEST RESULTS**

COMPANY NAME:	HONEYWELL INTERNATIONAL INC HONEYWELL SCANNING & MOBILITY
EUT DESCRIPTION:	Dolphin CT50
MODEL:	CT50L0N

**SERIAL NUMBER:** 15099404A2

DATE TESTED:

MAY 11 – JUNE 4, 2015

APPLICABLE STANDARDS				
STANDARD	TEST RESULTS			
CFR 47 Part 15 Subpart C	Pass			
INDUSTRY CANADA RSS-247 ISSUE 1	Pass			
INDUSTRY CANADA RSS-GEN ISSUE 4	Pass			

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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.

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Page 5 of 99

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2009 for FCC and ANSI C63.10-2013 for IC, RSS-GEN Issue 4, RSS-247 Issue 1.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
Chamber A(IC: 2324B-1)	Chamber D(IC: 2324B-4)
Chamber B(IC: 2324B-2)	Chamber E(IC: 2324B-5)
Chamber C(IC: 2324B-3)	Chamber F(IC: 2324B-6)
	Chamber G(IC: 2324B-7)
	Chamber H(IC: 2324B-8)

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <u>http://ts.nist.gov/standards/scopes/2000650.htm</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 18000 MHz	4.94 dB
Lineartainty figures are valid to a confident	

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

Page 6 of 99

## 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is a Dolphin CT50 Mobile Computer (Terminal).

The model CT50L0N shares the same enclosure and circuit board as model CT50LFN. The unlicensed radios (WLAN/BT/NFC) including antenna, are identical between the two units.

Difference is CT50L0N has only unlicensed radio but CT50LFN has unlicensed radio and licensed radio.

After confirming through preliminary radiated emissions that the performance of the CT50LFN data remains representative of this model (CT50L0N), CT50L0N leveraged test data from CT50LFN.

## 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	5.97	3.95
2402 - 2480	Enhanced 8PSK	6.55	4.52

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance. For average power data please refer to section 8.6.

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an embedded antenna, with a maximum gain of 1.7 dBi.

## 5.4. SOFTWARE AND FIRMWARE

Software version was FTM Tool version 1.7

## 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Page 7 of 99

## 5.6. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

Support Equipment List						
Description	Manufacturer	Model	Serial Number	FCC ID		
AC Adapter	PHIHONG	PSA10F-050Q	N/A	N/A		
USB CUP Adapter	Honeywell	N/A	N/A	N/A		

#### I/O CABLES

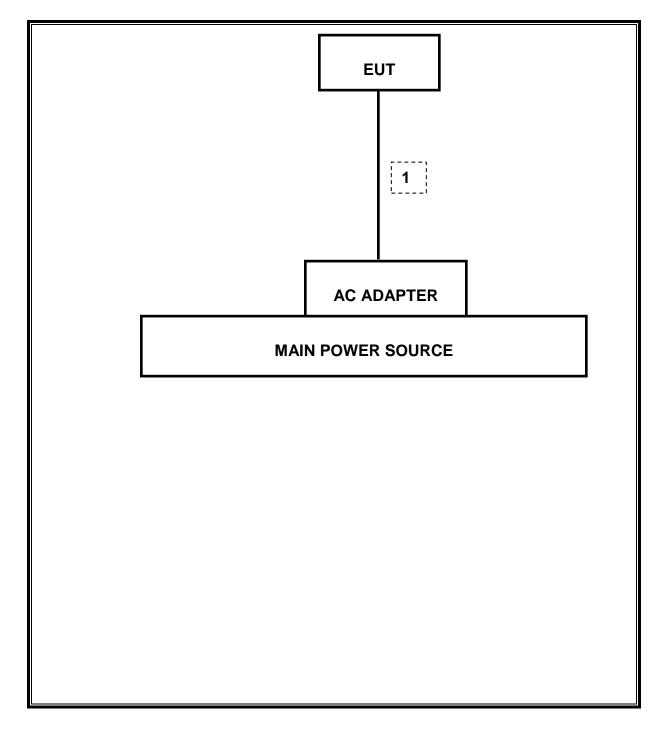
N/A

#### TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests. EUT was set in the Hidden menu mode to enable BT communications.

Page 8 of 99

#### SETUP DIAGRAM FOR TESTS



Page 9 of 99

# 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		
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/16		
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/15		
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/15		
RF Preamplifier, 100KHz -> 1300MHz	HP	8447D	T10	01/06/16		
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	924343	03/23/16		
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	F00351	06/27/15		
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/15		
CBT Bluetooth Tester	R & S	СВТ	None	07/12/15		
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/15		
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/15		
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/16		
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR		
Radiated Software	UL	UL EMC	Ver 9.5, July	22, 2014		
Conducted Software	UL	UL EMC	Ver 9.5, Ma	y 17 2012		
CLT Software	UL	UL RF	Ver 1.0, Feb	2 2015		
Antenna Port Software	UL	UL RF	Ver 2.1.1.1,	Jan 20 2015		

Page 10 of 99

# 7. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	RSS-GEN 6.6	Occupied Band width (99%)	N/A		Pass	673 kHz
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-44 dBm
15.247 (b)(1)	RSS-247 5.4(1)	TX conducted output power	<21dBm		Pass	6.55 dBm
15.247 (a)(1)	RSS-247 5.1 (1)	Hopping frequency separation	> 25KHz	Conducted	Pass	1 MHz
15.247 (a)(1)(iii)	RSS-247 5.1(4)	Number of Hopping channels	More than 15 non- overlapping channels		Pass	79 channels
15.247 (a)(1)(iii)	RSS-247 5.1(4)	Avg Time of Occupancy	< 0.4sec		Pass	0.092 s
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	Pass	51.63 dBuV (QP)
15.205, 15.209	RSS-GEN 8.9	Radiated Spurious Emission	< 54dBuV/m	Taulateu	Pass	27.1 dBuV/m

Page 11 of 99

## 8. ANTENNA PORT TEST RESULTS

## 8.1. 20 dB AND 99% BANDWIDTH

### <u>LIMIT</u>

None; for reporting purposes only.

#### TEST PROCEDURE

DA 00-705: 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	0.673	0.60124
Middle	2441	0.6761	0.67306
High	2480	0.6716	0.52592
Worst		0.6761	0.67306

### 8.1.1. BASIC DATA RATE GFSK MODULATION

## 8.1.2. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.0837	0.41036
Middle	2441	1.0809	0.34237
High	2480	1.0759	0.35447
Worst		1.0837	0.41036

Page 12 of 99

## 8.1.3. 20 dB AND 99% BANDWIDTH PLOTS

#### GFSK 20 dB BANDWIDTH



LOW CHANNEL

Page 13 of 99

## **MID CHANNEL**



Page 14 of 99

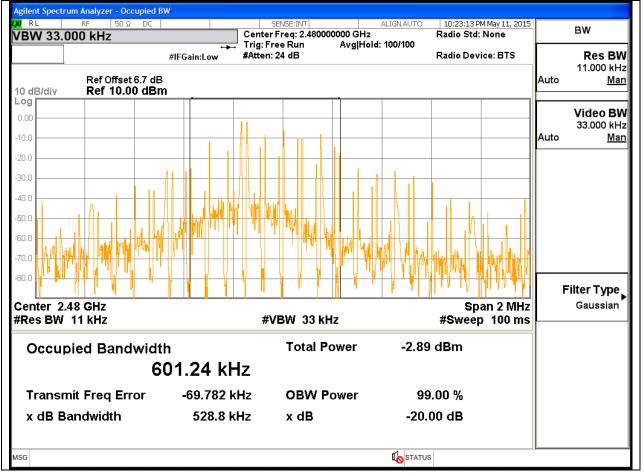
## **HIGH CHANNEL**



Page 15 of 99

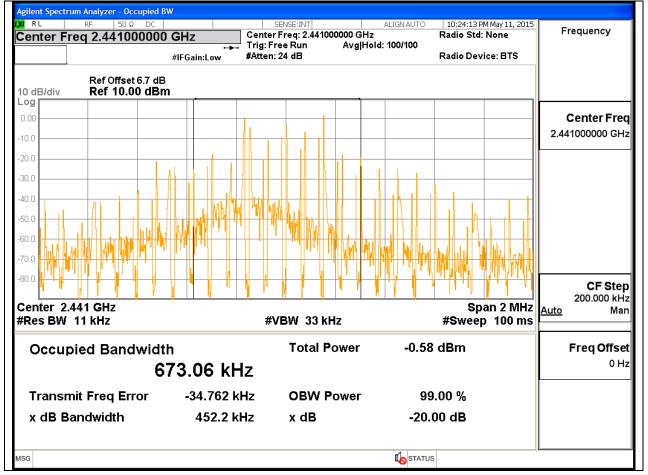
#### GFSK 99% BANDWIDTH

### LOW CHANNEL



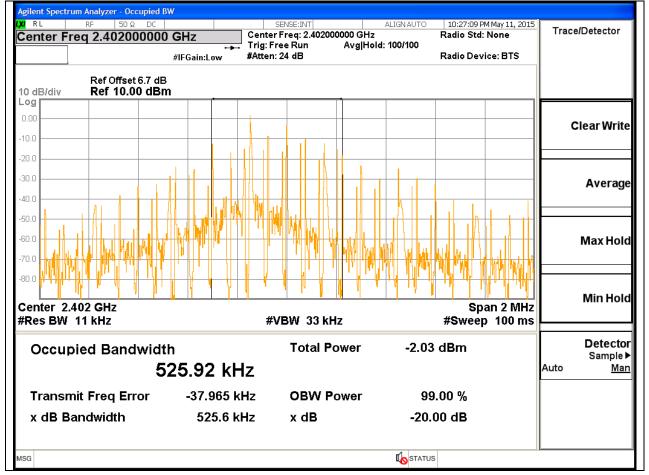
Page 16 of 99

## **MID CHANNEL**



Page 17 of 99

### **HIGH CHANNEL**



Page 18 of 99

#### 8PSK 20 dB BANDWIDTH

### LOW CHANNEL



Page 19 of 99

## **MID CHANNEL**



Page 20 of 99

Agilent Spectrum Analyzer - Swept SA

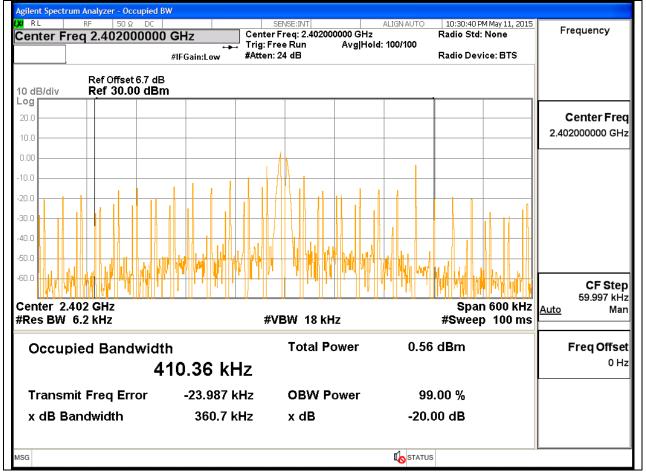
#### **HIGH CHANNEL** SENSE:INT ALIGN AUTO #Avg Type: RMS Trig: Free Run PNO: Wide 😱 IFGain:Low Atten: 24 dB



Page 21 of 99

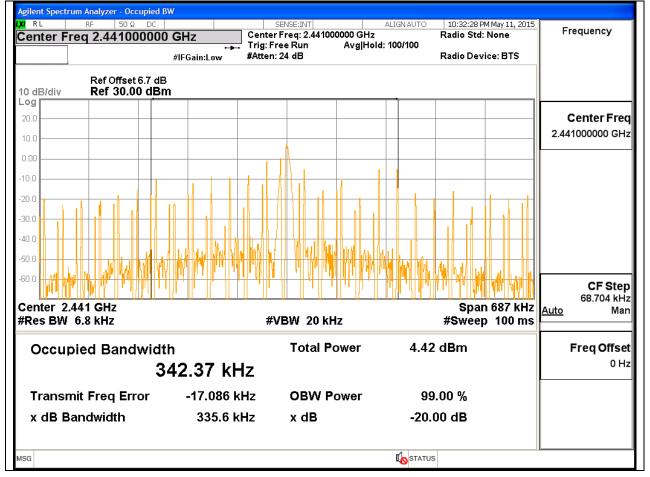
#### 8PSK 99% BANDWIDTH

### LOW CHANNEL



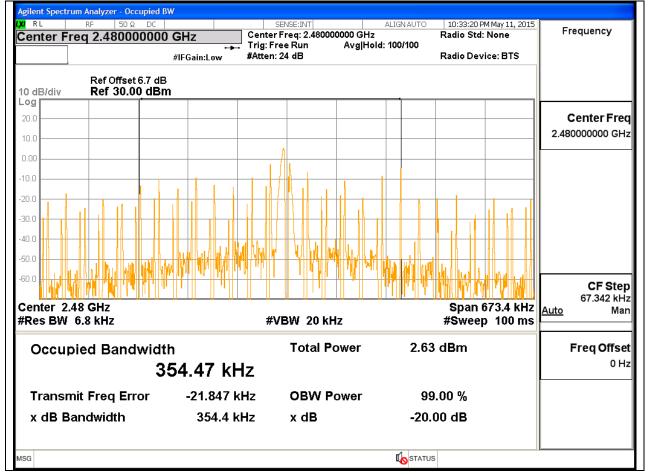
Page 22 of 99

## **MID CHANNEL**



Page 23 of 99

### **HIGH CHANNEL**



Page 24 of 99

## 8.2. HOPPING FREQUENCY SEPARATION

### <u>LIMIT</u>

FCC §15.247 (a) (1)

IC RSS-247 5.1(1)

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.

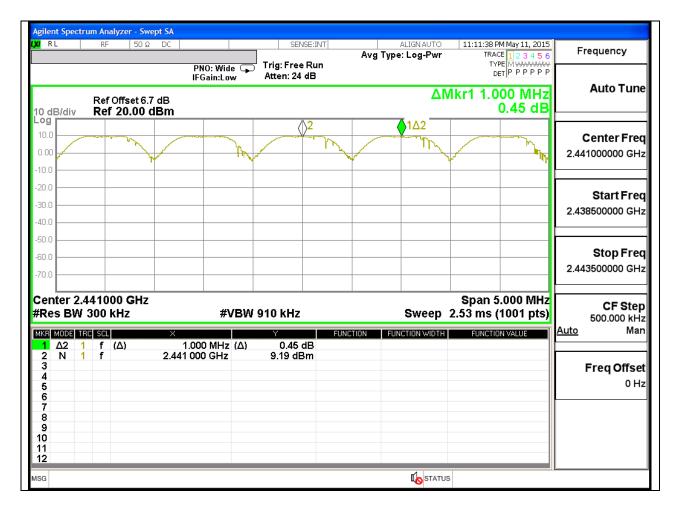
#### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### **RESULTS**

Page 25 of 99

#### HOPPING FREQUENCY SEPARATION PLOT



Page 26 of 99

## 8.3. NUMBER OF HOPPING CHANNELS

### <u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1(4)

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

#### TEST PROCEDURE

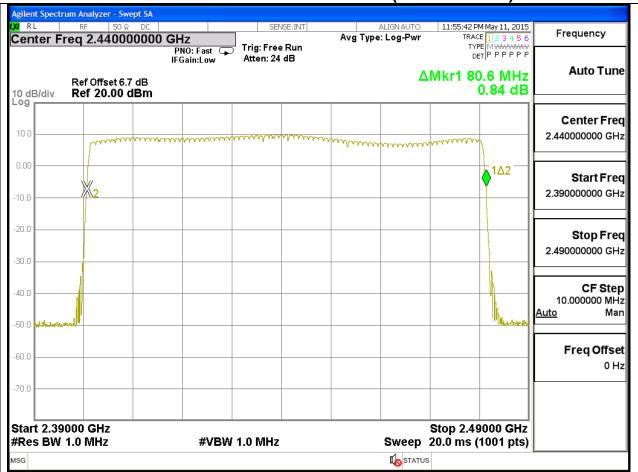
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

#### <u>RESULTS</u>

Normal Mode: 79 Channels observed.

Page 27 of 99

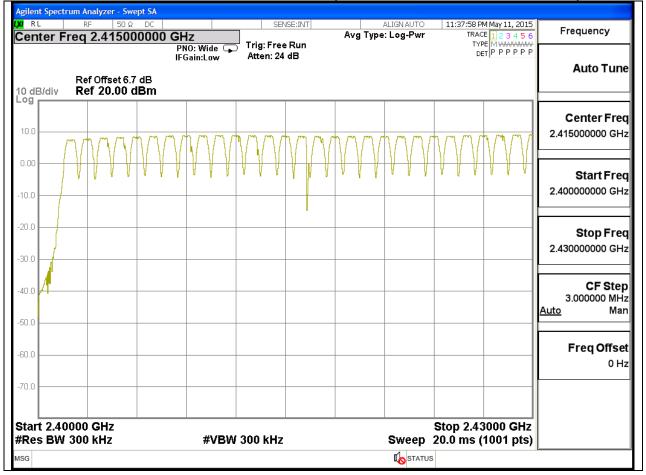
#### NUMBER OF HOPPING CHANNELS PLOTS



### NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)

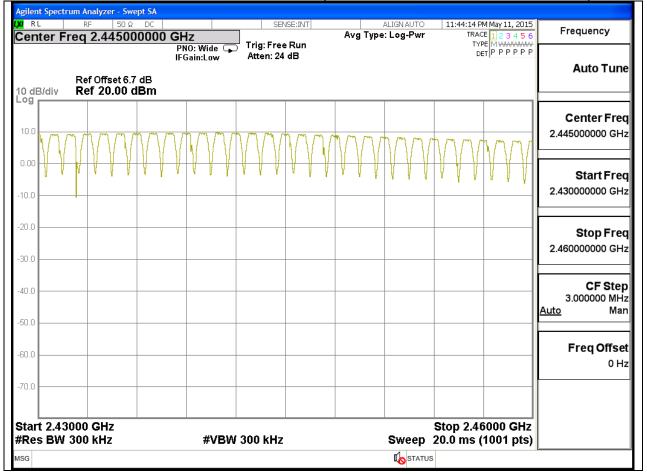
Page 28 of 99

### NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



Page 29 of 99

### NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



Page 30 of 99

#### gilent Spectrum Analyzer - Swept SA RF 11:50:32 PM May 11, 2015 RL ALIGN AUTO SENSE:INT Frequency Center Freq 2.475000000 GHz TRACE 1 2 3 4 5 6 Avg Type: Log-Pwr Trig: Free Run PNO: Wide 😱 IFGain:Low DET PPPPPP Atten: 24 dB Auto Tune Ref Offset 6.7 dB 10 dB/div Log Ref 20.00 dBm **Center Freq** 10.0 2.475000000 GHz Start Freq 2.460000000 GHz -10.0 -20.0 Stop Freq 2.49000000 GHz -30.0 CF Step -40.0 3.000000 MHz Man Auto -50.0 Freq Offset -60.0 0 Hz -70.0 Start 2.46000 GHz Stop 2.49000 GHz #Res BW 300 kHz #VBW 300 kHz Sweep 20.0 ms (1001 pts) ISG **I**STATUS

### NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)

Page 31 of 99

## 8.4. AVERAGE TIME OF OCCUPANCY

### <u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1(4)

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.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to 10 \* (# of pulses in 0.8 s) \* pulse width.

DH Packet	Pulse	Number of	Average Time	Limit	Margin				
	Width	Pulses in	of Occupancy						
	(msec)	3.16	(sec)	(sec)	(sec)				
		seconds							
GFSK Normal Mode									
DH1	0.299	31	0.09269	0.4	-0.30731				
DH3	0.308	19	0.05852	0.4	-0.34148				
DH5	0.304	11	0.03344	0.4	-0.36656				
DH Packet	DH Packet Pulse		Average Time	Limit	Margin				
	Width	Pulses in	of Occupancy						
	(msec)	0.8 seconds	(sec)	(sec)	(sec)				
GFSK AFH	Mode								
DH1	0.299	7.75	0.0231725	0.4	-0.37683				
DH3	0.308	4.75	0.01463	0.4	-0.38537				
DH5	0.304	2.75	0.00836	0.4	-0.39164				

### RESULTS

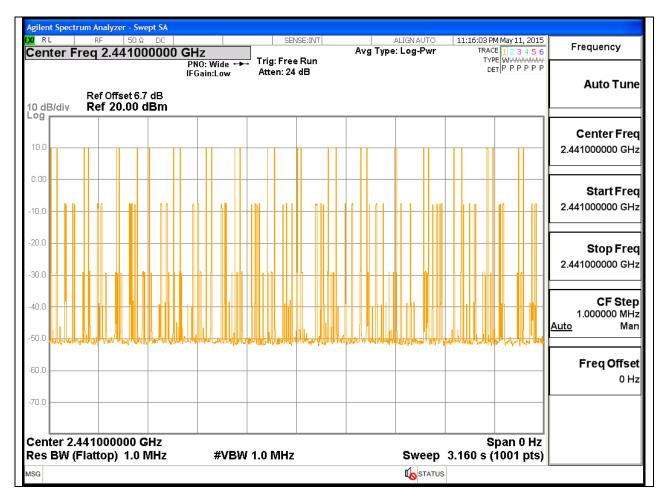
Page 32 of 99

## PULSE WIDTH - DH1

								- Swept SA		ectrum		-
Marker	58 PM May 11, 2015 TRACE 1 2 3 4 5 6	TRA	ALIGNAUTO :: Log-Pwr		vse:INT v <b>y: -100.0 µs</b>	Trig Dela		50Ω DC   00 μs		1Δ		w. Mai
Select Marker	TYPE WWWWWWW DET P P P P P		Trig: Video Atten: 24 dB			PNO: Wide ↔→ IFGain:Low						
1	Ref Offset 6.7 dB         ΔMkr1 299.0 μs           10 dB/div         Ref 20.00 dBm         1.68 dB							10 d Log				
Norma	_					1Δ2			×2		-	10.0
	TRIG LVL											0.00 -10.0
Delta												-20.0
Dena												-30.0 -40.0
	hter the second s	J via Armshidan J		olland d. rM	he to delate	1. Martha Arcenter				Mahw	<b>.</b>	-50.0
Fixed▷	da da Jaldua ta		and the second	Man Hand Low	audhru (, 1.11					เตทๆ	PT	-70.0
	Span 0 Hz						<i>///</i> ( <b>–</b> ).41	0 GHz				
Of	es BW (Flattop) 1.0 MHz #VBW 1.0 MHz Sweep 1.000 ms (1001 pts)											
						1.68 8.06 dE	299.0 μs (Δ) 99.00 μs		t (∆) t	1		1
Properties												3 4 5
												6 7 8
More 1 of 2												9 10
												11 12
		JS										MSG

Page 33 of 99

### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



Page 34 of 99

## **PULSE WIDTH - DH3**

Ω DC	SENSE:INT Trig Delay: -200.0 μs	ALIGN AUTO Avg Type: Log-Pwr	11:21:52 PM May 11, 2015 TRACE 1 2 3 4 5 6 TYPE WWWWWWW	Frequency
PNO: Wide ↔ IFGain:Low .7 dB dBm	' Trig: Video Atten: 24 dB		Mkr1 308.0 μs 0.78 dB	Auto Tu
			TRIG LVL	<b>Center Fr</b> 2.441000000 G
				Start Fr 2.441000000 G
	llinger ingen gegen der son der	y he partific flat ha partific flat and the second s	WARANIA ANTA ANALA	Stop Fr 2.441000000 G
GHz MHz #VBW	1.0 MHz		Span 0 Hz .000 ms (1001 pts) FUNCTION VALUE	CF St 1.000000 N <u>Auto</u> N
308.0 µs (Δ) 196.0 µs	0.78 dB 9.00 dBm			Freq Off
			To status	The status

Page 35 of 99

### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH3



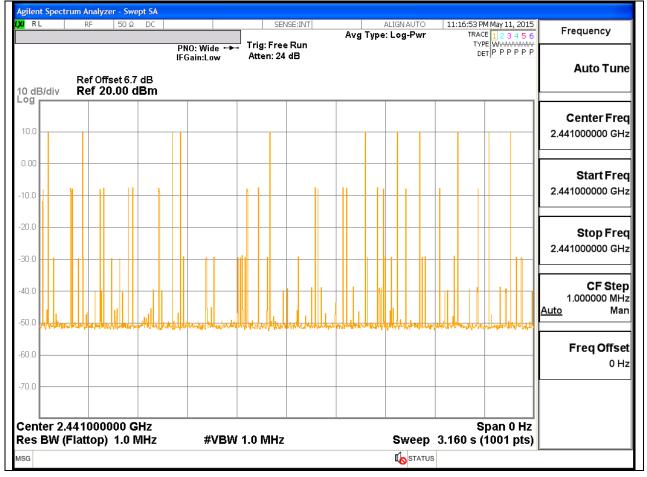
Page 36 of 99

# **PULSE WIDTH - DH5**

ent Spectru		yzer - S	wept SA									
(L	RF	50	Ω DC				ISE:INT <b>V: -400.0 µs</b>		ALIGNAUTO e: Log-Pwr		M May 11, 2015 CE 1 2 3 4 5 6	Frequency
	Def	)ffset 6	7 40	PNO: V IFGain:	Vide ↔ Low		0		-	TY D	PE WWWWWW ET P P P P P P 304.0 μs	Auto Tu
/div		20.00	dBm								0.46 ḋB	
			142									Center Fr
	//\\2											2.441000000 G
											TRIG LVL	
												Start Fi
												2.441000000
hemathered	A.M.		undud	white	hikad		hander & reader	White North	hand hand	walname	Annound and the state of the	Stop F
- • • • • • • •	Ψ		Hut to		Mikti	<del>8.0</del>		-t-dratu.	1 <del>4. 6 <b>4</b> 4</del> 11 6 4 8	1.8.8.6.0		2.441000000 0
ter 2.4 BW (F					#\/D\M	1.0 MHz			Ourson A		Span 0 Hz (1001 pts)	CF St
		p) 1.0			#VDVV				-			1.000000 M Auto
Mode Tro A2 1	t (	Δ)	×	304.0		0.46		TIUN FUR	NCTION WIDTH	FUNCTI	ON VALUE	
F 1	t			392.0	ls	9.26 dE	3m					Freq Off
												C

Page 37 of 99

# NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH5



Page 38 of 99

# 8.5. OUTPUT POWER

# <u>LIMIT</u>

§15.247 (b) (1)

RSS-247 5.4(1)

The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

# TEST PROCEDURE

DA 00-705: 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	3.84	21	-17.156
Middle	2441	5.97	21	-15.03
High	2480	4.45	21	-16.546
Worst		5.97		-15.03

### 8.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency	Output Power	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	4.45	21	-16.547
Middle	2441	6.55	21	-14.453
High	2480	5.02	21	-15.978
Worst		6.55		-14.453

Page 39 of 99

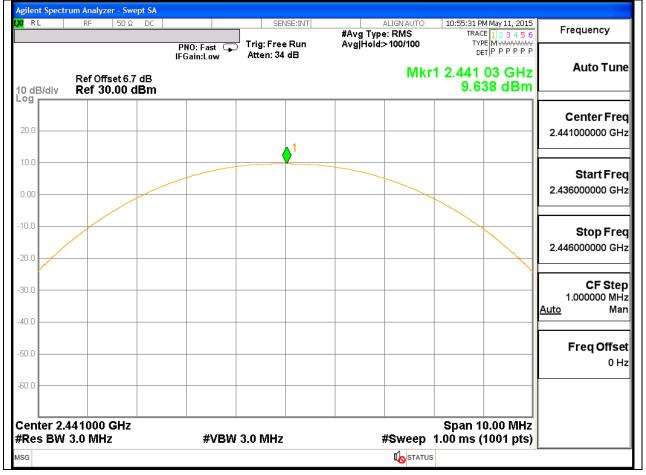
# 8.5.3. OUTPUT POWER PLOTS

### **GFSK OUTPUT POWER**

Agilent Spect							
LXURL	RF	50 Ω DC		SENSE:INT	ALIGN AUTO	10:55:09 PM May 11, 2015 TRACE 1 2 3 4 5 6	Frequency
10 dB/div	Ref Offse Ref 30.0		PNO: Fast 🍙 IFGain:Low	<sup>1</sup> Trig: Free Run Atten: 34 dB	Avg Hold⇒100/100 Mkr	TYPE DET P P P P P 1 2.402 13 GHz 7.479 dBm	Auto Tune
20.0							Center Freq 2.402000000 GHz
0.00							<b>Start Fred</b> 2.397000000 GHz
-10.0							<b>Stop Fred</b> 2.407000000 GH:
-30.0							<b>CF Step</b> 1.000000 MH <u>Auto</u> Mar
-50.0							Freq Offse 0 H
-60.0							
Center 2. #Res BW		iHz	#VBW	3.0 MHz	#Sweep	Span 10.00 MHz 1.00 ms (1001 pts)	
MSG					<b>I</b> o status		

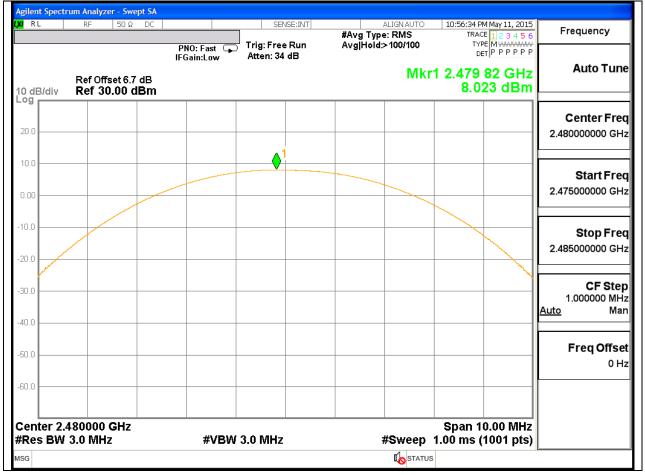
### LOW CHANNEL

# **MID CHANNEL**



Page 41 of 99

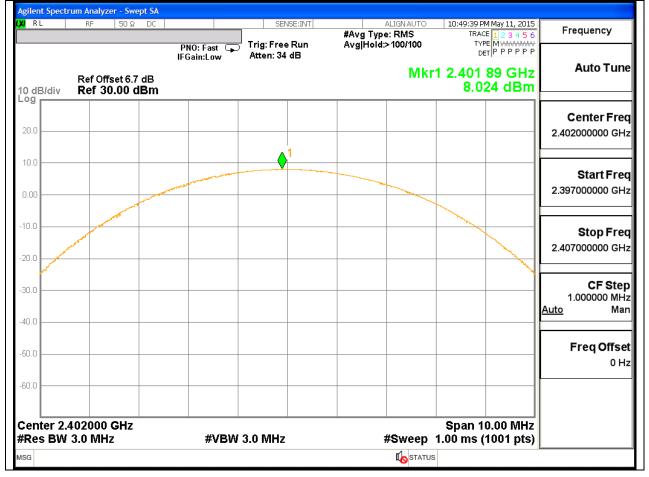
# **HIGH CHANNEL**



Page 42 of 99

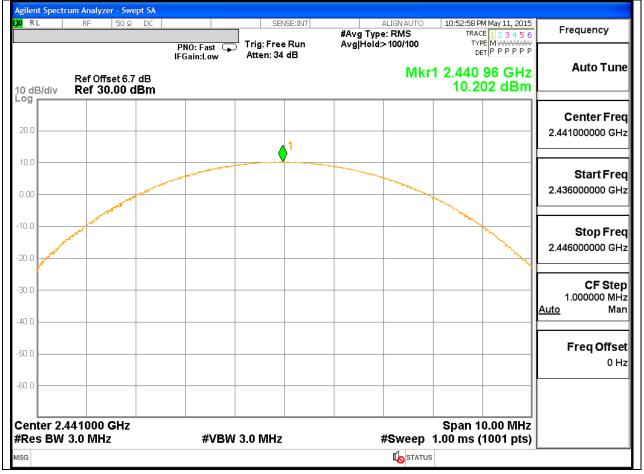
### **8PSK OUTPUT POWER**

### LOW CHANNEL



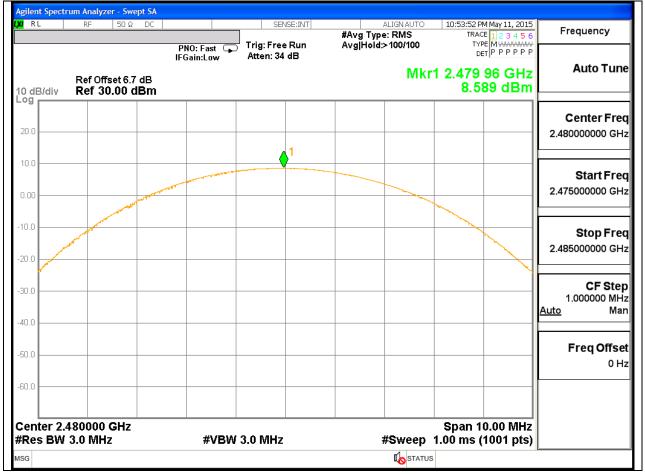
Page 43 of 99

# **MID CHANNEL**



Page 44 of 99

# **HIGH CHANNEL**



Page 45 of 99

# 8.6. AVERAGE POWER

### <u>LIMIT</u>

None; for reporting purposes only.

### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a power meter.

### **RESULTS**

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

# 8.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	3.6
Middle	2441	5.8
High	2480	4.4
Worst		5.8

# 8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency	Average Power				
	(MHz)	(dBm)				
Low	2402	2.30				
Middle	2441	4.30				
High	2480	2.90				
Worst		4.30				

Page 46 of 99

# 8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency	Average Power
	(MHz)	(dBm)
Low	2402	2.2
Middle	2441	4.3
High	2480	2.9
Worst		4.3

Page 47 of 99

# 8.7. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

FCC §15.247 (d)

IC RSS-247 5.5

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.

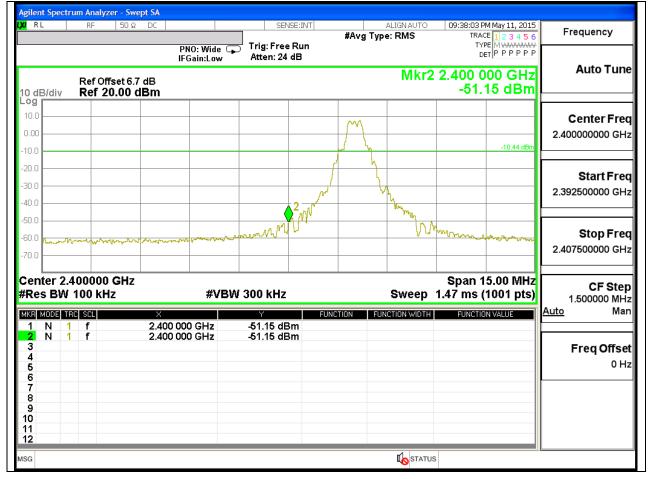
### RESULTS

Page 48 of 99

# 8.7.1. BASIC DATA RATE GFSK MODULATION

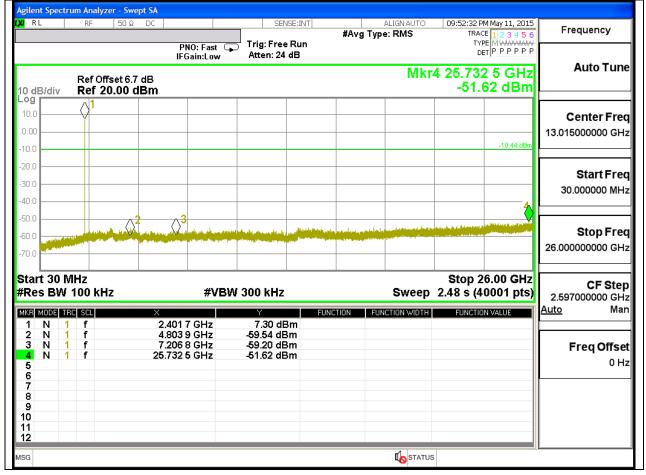
#### SPURIOUS EMISSIONS, LOW CHANNEL

### LOW CHANNEL BANDEDGE



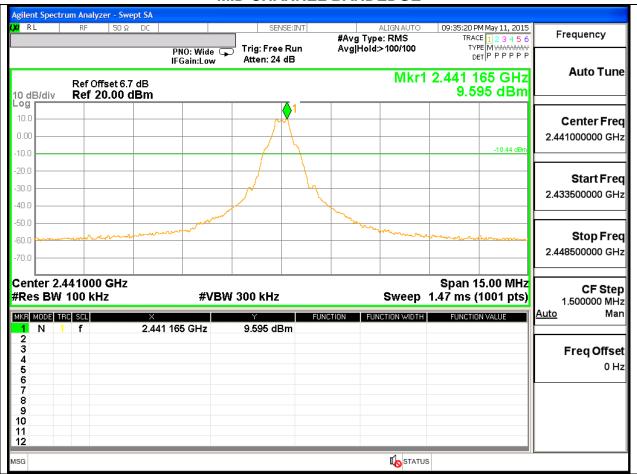
Page 49 of 99

# LOW CHANNEL SPURIOUS



Page 50 of 99

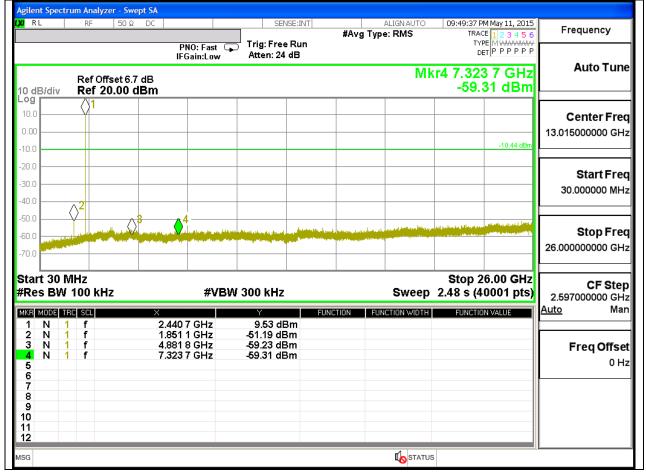
### SPURIOUS EMISSIONS, MID CHANNEL



# **MID CHANNEL BANDEDGE**

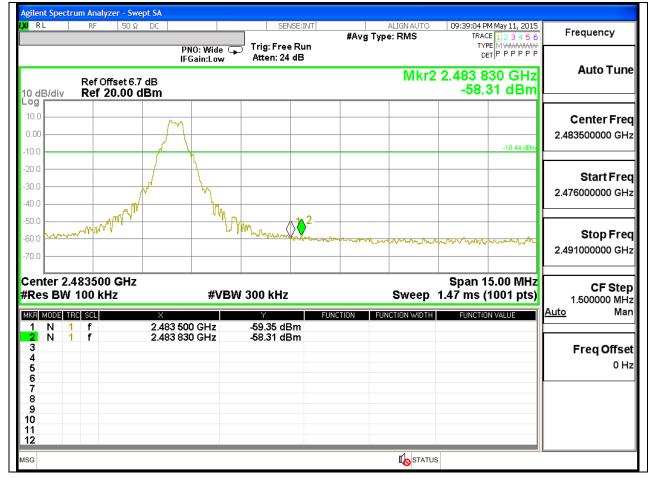
Page 51 of 99

# **MID CHANNEL SPURIOUS**



Page 52 of 99

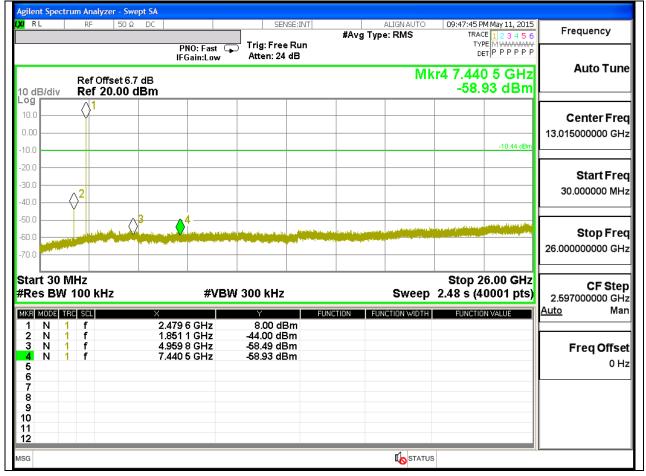
### SPURIOUS EMISSIONS, HIGH CHANNEL



# **HIGH CHANNEL BANDEDGE**

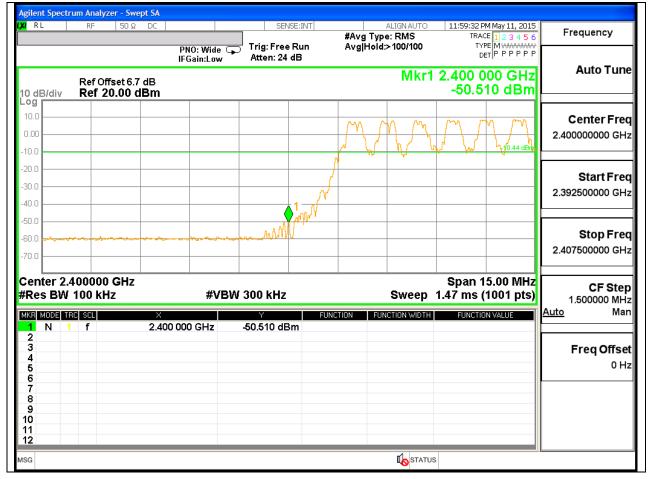
Page 53 of 99

# **HIGH CHANNEL SPURIOUS**



Page 54 of 99

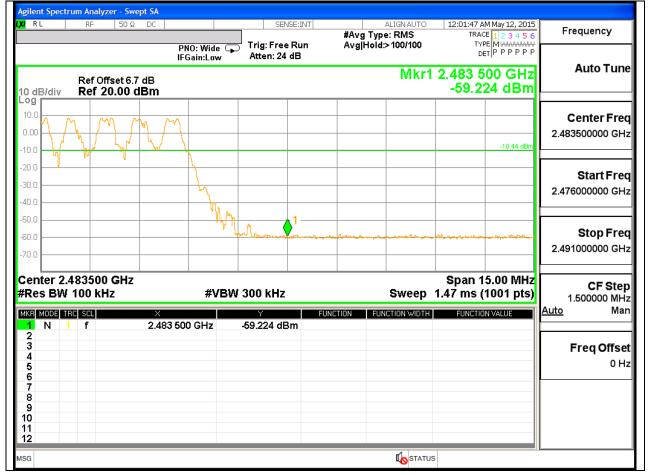
### SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



### LOW BANDEDGE WITH HOPPING ON

Page 55 of 99

# HIGH BANDEDGE WITH HOPPING ON



Page 56 of 99

# 8.7.2. ENHANCED DATA RATE 8PSK MODULATION

### SPURIOUS EMISSIONS, LOW CHANNEL

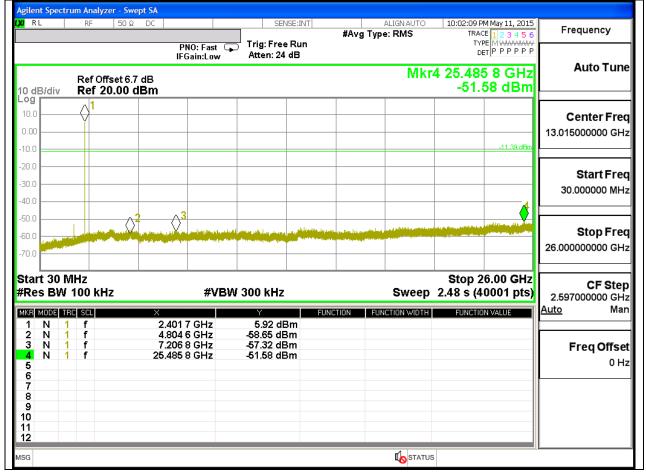
#### gilent Spectrum Analyzer - Swept SA RL RF 50Ω DC ALIGN AUTO 09:42:11 PM May 11, 2015 SENSE:INT Frequency TRACE 1 2 3 4 5 6 TYPE M WWWWWW #Avg Type: RMS Trig: Free Run PNO: Wide IFGain:Low DETPPPPP Atten: 24 dB Auto Tune Mkr2 2.399 955 GHz Ref Offset 6.7 dB -50.80 dBm 10 dB/div Ref 20.00 dBm Log 10.0 Center Freq 0.00 2.40000000 GHz 11.39 dE -10.0 -20.0 Start Freq -30.0 2.392500000 GHz 40.0 2 -50.0 Stop Freq m -60.0 www.hww 2.407500000 GHz 70.0 Center 2.400000 GHz Span 15.00 MHz CF Step #Res BW 100 kHz #VBW 300 kHz Sweep 1.47 ms (1001 pts) 1.500000 MHz <u>Auto</u> Man MKR MODE TRC SCL FUNCTION WIDTH FUNCTION VALUE FUNCTION 2.400 000 GHz 2.399 955 GHz -51.53 dBm -50.80 dBm N N 1 f 2 3 4 **Freq Offset** 0 Hz 5 6 7 8 9 10 11 12 /ISG 🕼 STATUS

# LOW CHANNEL BANDEDGE

UL VERIFICATION SERVICES INC. 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

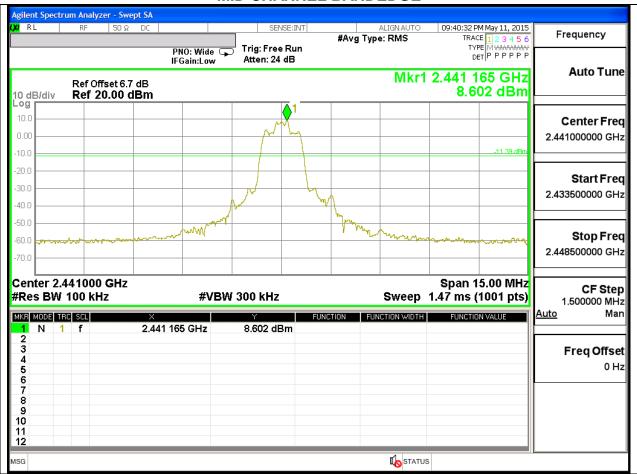
Page 57 of 99

# LOW CHANNEL SPURIOUS



Page 58 of 99

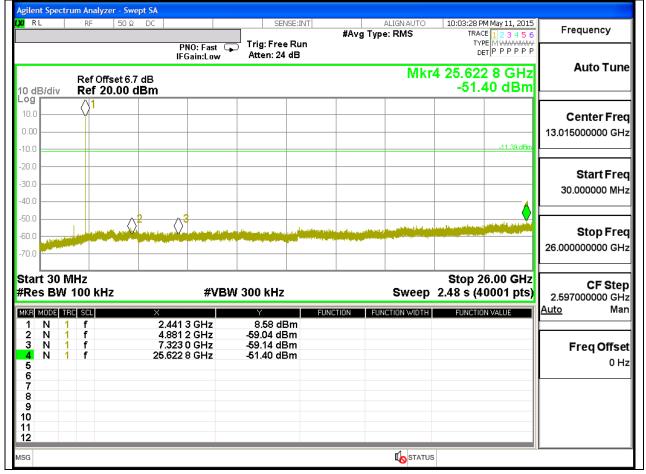
### SPURIOUS EMISSIONS, MID CHANNEL



# **MID CHANNEL BANDEDGE**

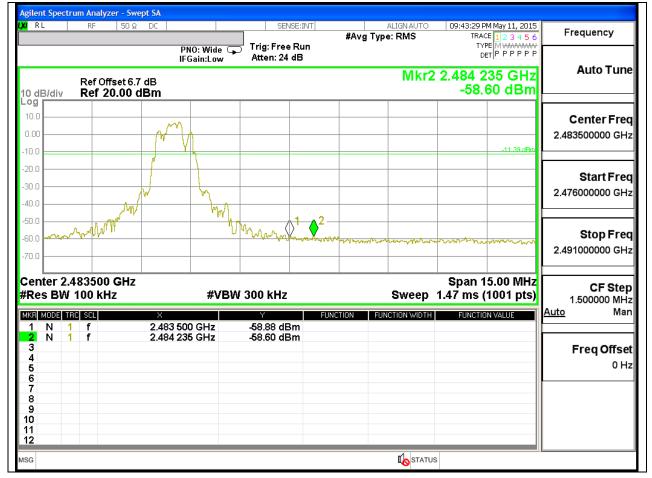
Page 59 of 99

# **MID CHANNEL SPURIOUS**



Page 60 of 99

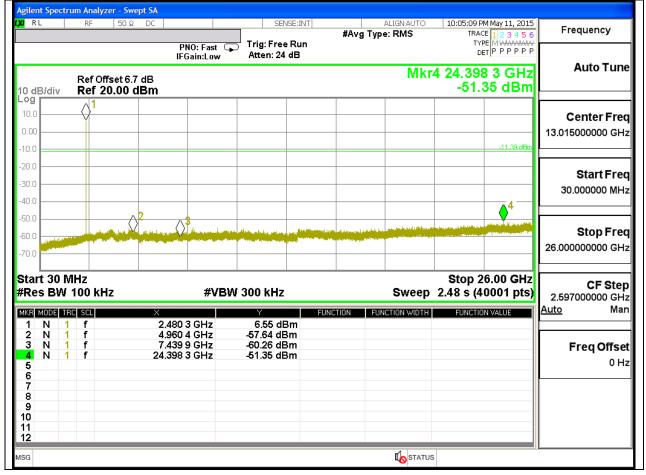
### SPURIOUS EMISSIONS, HIGH CHANNEL



# **HIGH CHANNEL BANDEDGE**

Page 61 of 99

# **HIGH CHANNEL SPURIOUS**



Page 62 of 99

### SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



### LOW BANDEDGE WITH HOPPING ON

Page 63 of 99

# HIGH BANDEDGE WITH HOPPING ON



Page 64 of 99

# 9. RADIATED TEST RESULTS

# 9.1. LIMITS AND PROCEDURE

# <u>LIMITS</u>

FCC §15.205 and §15.209

IC RSS-GEN Clause 8.9 (Transmitter)

IC RSS-GEN Clause 7 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (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 band edge 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 1/T (on time) for average measurement. GFSK = 1/T = 1 / 0.0028S = 360Hz. 8PSK = 1/T = 1 / 0.0028S = 360Hz

The spectrum from 1GHzHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

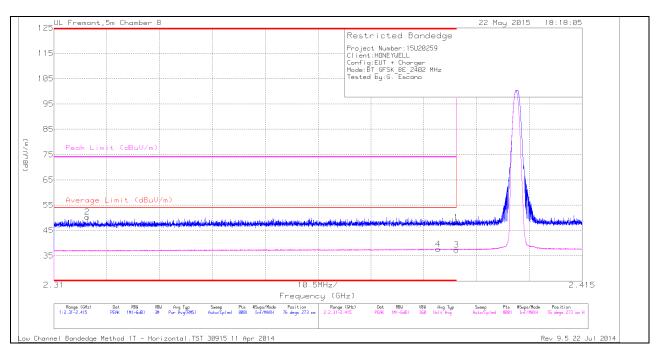
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

Page 65 of 99

# 9.2. TRANSMITTER ABOVE 1 GHz

# 9.2.1. BASIC DATA RATE GFSK MODULATION

# **RESTRICTED BANDEDGE (LOW CHANNEL)**



### HORIZONTAL PEAK AND AVERAGE PLOT

#### HORIZONTAL DATA

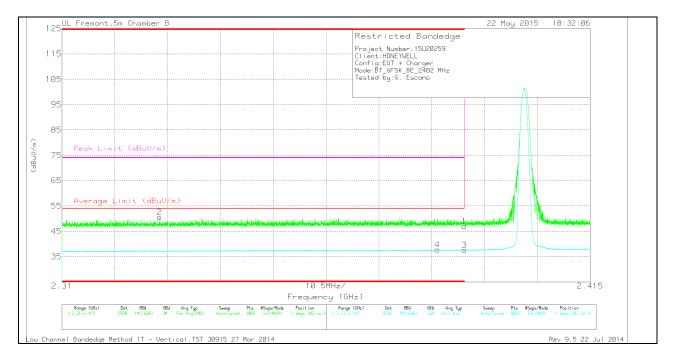
Marker	Frequency (GHz)	Meter Reading	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad	Corrected Reading	Average Limit	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.39	38.74	РК	32	-22.6	48.14	-	-	74	-25.86	76	273	н
2	* 2.317	41.34	РК	31.6	-22.7	50.24	-	-	74	-23.76	76	273	н
3	* 2.39	28.02	VB1T	32	-22.6	37.42	54	-16.58	-	-	76	273	н
4	* 2.386	28.23	VB1T	32	-22.6	37.63	54	-16.37	-	-	76	273	н

\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

#### VERTICAL PEAK AND AVERAGE PLOT



#### VERTICAL DATA

Marker	Frequency	Meter	Det	AF T345	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.39	37.49	РК	32	-22.6	46.89	-	-	74	-27.11	1	342	V
2	* 2.329	41.53	РК	31.7	-22.7	50.53	-	-	74	-23.47	1	342	V
3	* 2.39	28.1	VB1T	32	-22.6	37.5	54	-16.5	-	-	1	342	V
4	* 2.385	28.38	VB1T	32	-22.6	37.78	54	-16.22	-	-	1	342	V

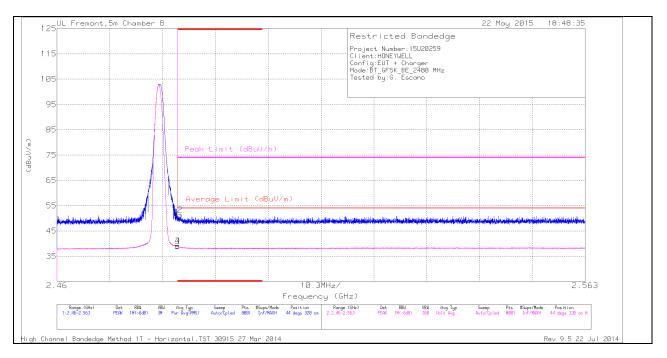
\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

Page 67 of 99

# AUTHORIZED BANDEDGE (HIGH CHANNEL)



### HORIZONTAL PEAK AND AVERAGE PLOT

#### HORIZONTAL DATA

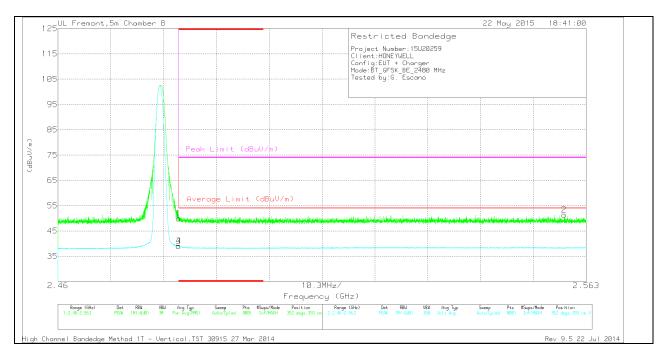
Marker	Frequency	Meter	Det	AF T345	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	40.43	PK	32.5	-22.4	50.53	-	-	74	-23.47	44	320	Н
2	* 2.484	41.17	РК	32.5	-22.4	51.27	-	-	74	-22.73	44	320	н
3	* 2.484	28.92	VB1T	32.5	-22.4	39.02	54	-14.98	-	-	44	320	Н
4	* 2.484	28.99	VB1T	32.5	-22.4	39.09	54	-14.91	-	-	44	320	Н

\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

Page 68 of 99



### VERTICAL PEAK AND AVERAGE PLOT

#### VERTICAL DATA

Marker	Frequency	Meter	Det	AF T345	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	39.88	РК	32.5	-22.4	49.98	-	-	74	-24.02	352	393	V
3	* 2.484	28.95	VB1T	32.5	-22.4	39.05	54	-14.95	-	-	352	393	V
4	* 2.484	28.96	VB1T	32.5	-22.4	39.06	54	-14.94	-	-	352	393	V
2	2.559	41.13	РК	32.7	-22.4	51.43	-	-	74	-22.57	352	393	V

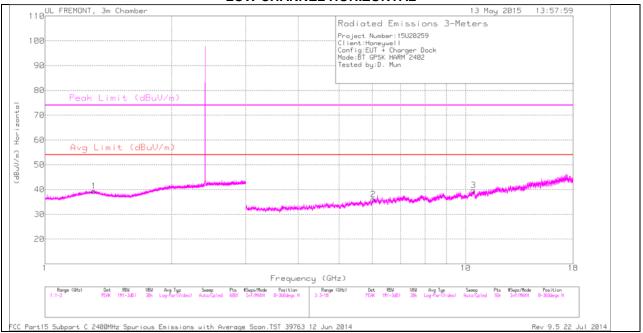
\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

Page 69 of 99

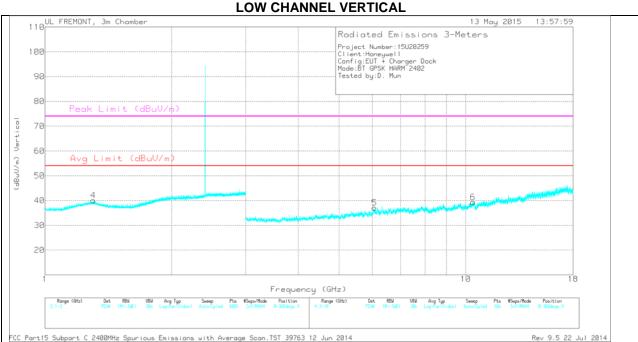
# HARMONICS AND SPURIOUS EMISSIONS



LOW CHANNEL HORIZONTAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 70 of 99



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 71 of 99

#### LOW CHANNEL DATA

#### TRACE MARKERS

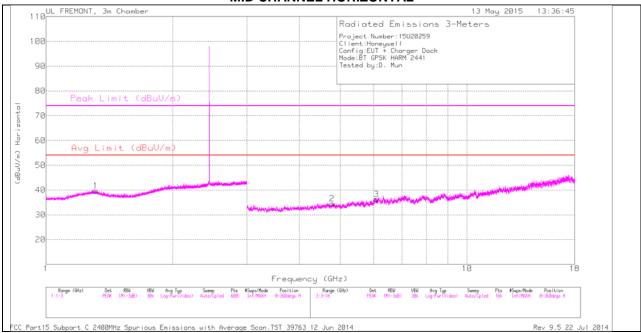
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.302	33.94	РК	29.9	-23.8	40.04	_		74	-33.96	0-360	200	V
4	1.502	55.94	PK	29.9	-25.0	40.04	-	-	74	-35.90	0-300	200	v
1	1.308	33.38	PK	29.8	-23.8	39.38	-	-	74	-34.62	0-360	200	Н
2	6.031	30.46	РК	35.2	-29.6	36.06	-	-	-	-	0-360	200	Н
5	6.066	30.94	PK	35.2	-29.1	37.04	-	-	-	-	0-360	100	V
6	10.4	27.29	PK	37.3	-25.3	39.29	-	-	-	-	0-360	100	V
3	10.437	27.77	PK	37.3	-25.3	39.77	-	-	-	-	0-360	100	н

PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

Page 72 of 99

#### **MID CHANNEL HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 73 of 99

#### MID CHANNEL VERTICAL 110 UL FREMONT, 3m Chamber 13 May 2015 13:36:45 Radiated Emissions 3-Meters Project Number:15U20259 Client:Honegwell Canfig:EUT + Charger Dack Mode:BT GPSK HARM 2441 Tested by:D. Mun 100 90 80 Peak Limit (dBuV/r 0 70 'n 60 Avg Limit (dBuU/m (mUUngp) 50 4 40 5 30 20 18 Frequency (GHz) Sveep Pts #Swps/Mode Position Range (GHz) Det RSU U81 38k Pts #Swps/Mode UBW Avg Typ Avg Typ Sweep Position Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 39763 12 Jun 2014 Rev 9.5 22 Jul 2014

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 74 of 99

### **MID CHANNEL DATA**

TRACE MARKERS

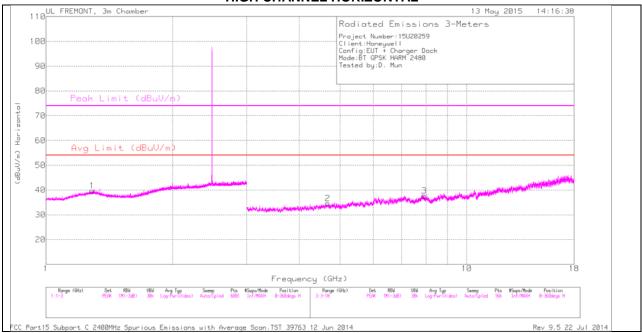
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.308	33.94	PK	29.8	-23.8	39.94	-	-	74	-34.06	0-360	100	V
1	1.312	33.8	PK	29.7	-23.8	39.7	-	-	74	-34.3	0-360	200	Н
2	4.782	30.9	PK	34	-30.4	34.5	-	-	74	-39.5	0-360	100	Н
5	4.791	31.71	PK	34	-30.4	35.31	-	-	74	-38.69	0-360	200	V
6	6.057	30.55	PK	35.2	-29.1	36.65	-	-	-	-	0-360	200	V
3	6.088	30	РК	35.2	-28.9	36.3	-	-	-	-	0-360	100	Н

PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

Page 75 of 99

#### **HIGH CHANNEL HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 76 of 99

Avg Limit (dBuV/m

De REU UBW Avg Typ

100 90 80

0 70

'n 60

(mUUngp) 50 40

> 30 20

18

Position

Pts #Swps/Mode

Sweep

## **HIGH CHANNEL VERTICAL** 110 UL FREMONT, 3m Chamber 13 May 2015 14:16:38 Radiated Emissions 3-Meters Project Number:15U20259 Client:Honegwell Canfig:EUT + Charger Dack Mode:BT GPSK HARM 2480 Tested by:D. Mun Peak Limit (dBuV/r

5

Range (GHz)

Det RSU U81 38k Avg Typ

Part15 Subpart C 2400MHz Spurious Emissions with Average Scan.TST 39763 12 Jun 2014 Rev 9.5 22 Jul 2014 Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Frequency (GHz)

Position

Sveep

Pts #Swps/Mode

Page 77 of 99

### **HIGH CHANNEL DATA**

TRACE MARKERS

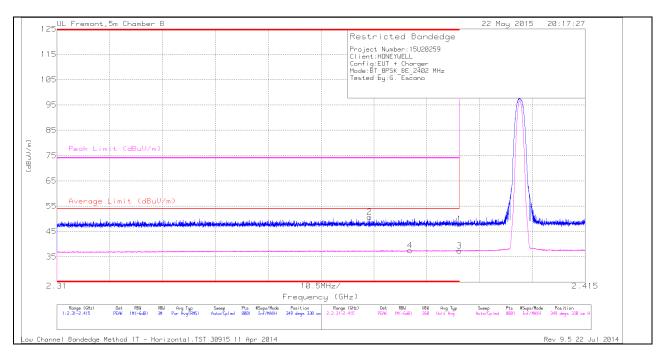
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.282	33.52	РК	29.7	-23.8	39.42	-	-	74	-34.58	0-360	100	V
1	1.287	33.56	РК	29.8	-23.7	39.66	-	-	74	-34.34	0-360	100	Н
5	4.634	31.03	РК	33.9	-30.9	34.03	-	-	74	-39.97	0-360	100	V
2	4.677	31.35	РК	34	-30.7	34.65	-	-	74	-39.35	0-360	100	Н
6	7.883	29.41	РК	35.8	-27.3	37.91	-	-	-	-	0-360	200	V
3	7.924	29.69	РК	35.8	-27.8	37.69	-	-	-	-	0-360	100	Н

PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

Page 78 of 99

# 9.2.2. ENHANCED DATA RATE 8PSK MODULATION RESTRICTED BANDEDGE (LOW CHANNEL)



# HORIZONTAL PEAK AND AVERAGE PLOT

# HORIZONTAL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.53	РК	32	-22.6	47.93	-	-	74	-26.07	349	330	Н
2	* 2.372	41.35	РК	31.9	-22.6	50.65	-	-	74	-23.35	349	330	Н
3	* 2.39	27.96	VB1T	32	-22.6	37.36	54	-16.64	-	-	349	330	Н
4	* 2.38	28.16	VB1T	32	-22.6	37.56	54	-16.44	-	-	349	330	Н

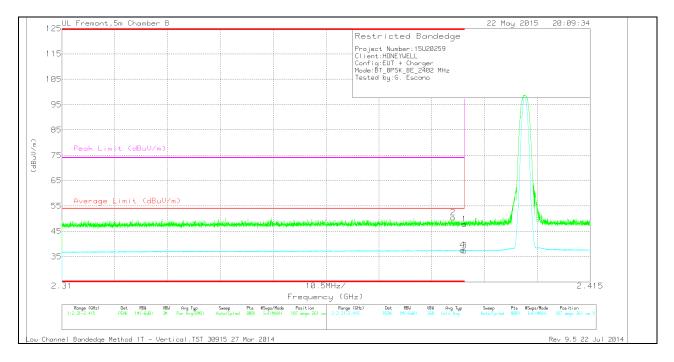
\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

#### PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

Page 79 of 99

## VERTICAL PEAK AND AVERAGE PLOT



### **VERTICAL DATA**

Marker	Frequency	Meter	Det	AF T345	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.39	38.43	РК	32	-22.6	47.83	-	-	74	-26.17	187	261	V
2	* 2.388	41	РК	32	-22.6	50.4	-	-	74	-23.6	187	261	V
3	* 2.39	28.02	VB1T	32	-22.6	37.42	54	-16.58	-	-	187	261	V
4	* 2.39	28.18	VB1T	32	-22.6	37.58	54	-16.42	-	-	187	261	V

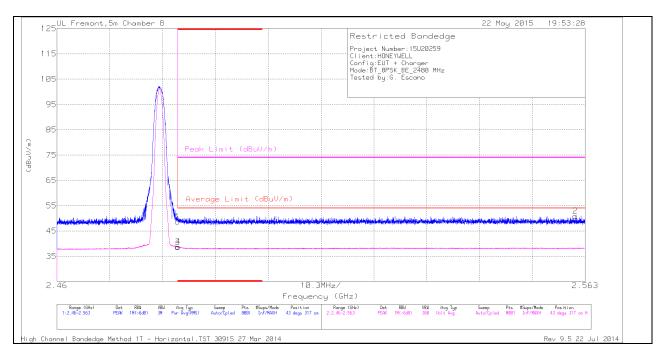
\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

Page 80 of 99

# **AUTHORIZED BANDEDGE (HIGH CHANNEL)**



## HORIZONTAL PEAK AND AVERAGE PLOT

### HORIZONTAL DATA

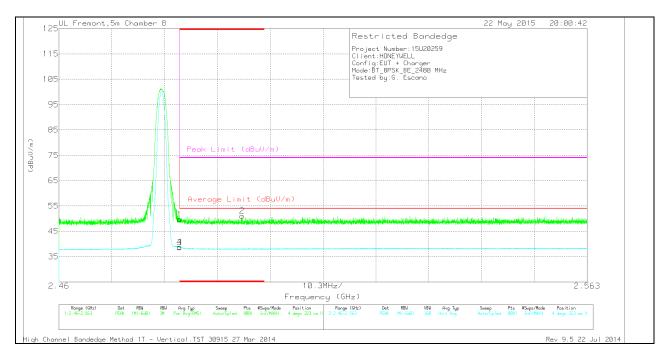
					-								
Marker	Frequency	Meter	Det	AF T345	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	38.53	РК	32.5	-22.4	48.63	-	-	74	-25.37	43	317	н
3	* 2.484	28.47	VB1T	32.5	-22.4	38.57	54	-15.43	-	-	43	317	Н
4	* 2.484	28.59	VB1T	32.5	-22.4	38.69	54	-15.31	-	-	43	317	н
2	2.561	40.56	РК	32.7	-22.3	50.96	-	-	74	-23.04	43	317	Н

\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

Page 81 of 99



## VERTICAL PEAK AND AVERAGE PLOT

### VERTICAL DATA

Marker	Frequency	Meter	Det	AF T345	Amp/Cbl/	Corrected	Average	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	Fltr/Pad	Reading	Limit	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)			(dB)	(dBuV/m)	(dBuV/m)						
1	* 2.484	39.58	РК	32.5	-22.4	49.68	-	-	74	-24.32	4	323	V
2	* 2.496	40.89	PK	32.5	-22.4	50.99	-	-	74	-23.01	4	323	V
3	* 2.484	28.48	VB1T	32.5	-22.4	38.58	54	-15.42	-	-	4	323	V
4	* 2.484	28.6	VB1T	32.5	-22.4	38.7	54	-15.3	-	-	4	323	V

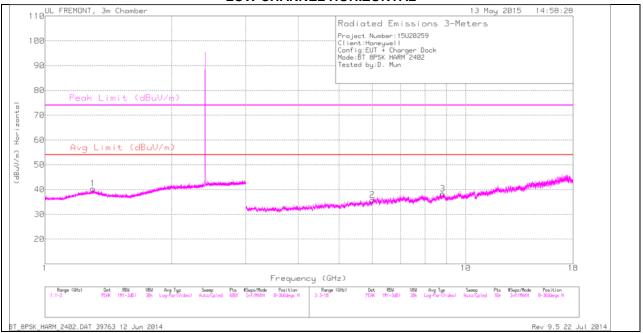
\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

Page 82 of 99

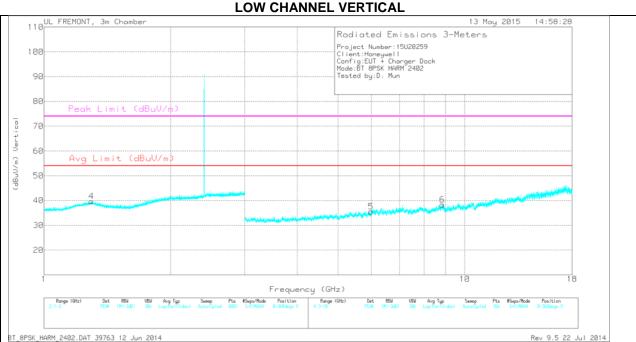
# HARMONICS AND SPURIOUS EMISSIONS



LOW CHANNEL HORIZONTAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 83 of 99



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 84 of 99

### LOW CHANNEL DATA

TRACE MARKERS

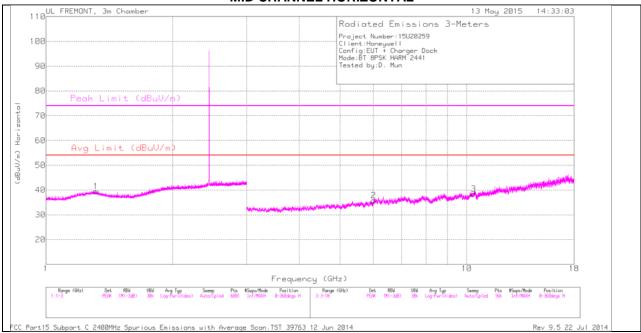
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
		10 · · /			(dB)	1 1							
4	1.296	33.6	PK	29.9	-23.8	39.7	-	-	74	-34.3	0-360	100	V
1	1.301	34.31	PK	29.9	-23.8	40.41	-	-	74	-33.59	0-360	100	Н
5	5.992	30.74	PK	35.2	-30.4	35.54	-	-	-	-	0-360	100	V
2	5.998	30.84	PK	35.2	-30.2	35.84	-	-	-	-	0-360	100	Н
3	8.822	29.03	PK	35.9	-26.6	38.33	-	-	-	-	0-360	200	Н
6	8.842	28.97	PK	35.9	-26.6	38.27	-	-	-	-	0-360	100	V

PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

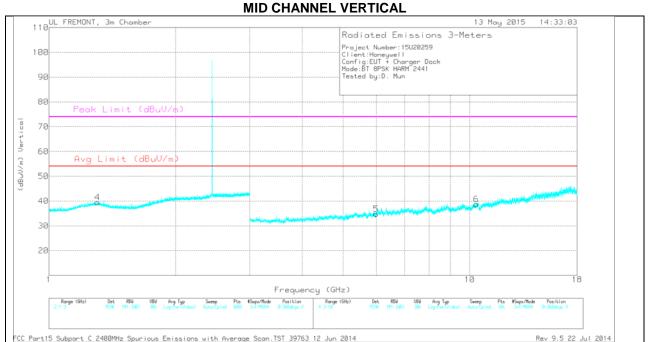
Page 85 of 99

#### MID CHANNEL HORIZONTAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 86 of 99



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 87 of 99

### **MID CHANNEL DATA**

#### TRACE MARKERS

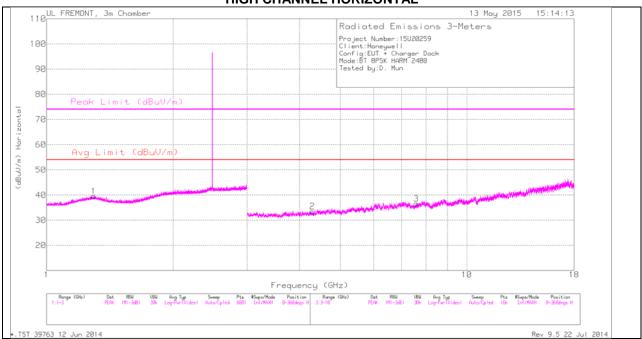
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.304	33.42	РК	29.8	-23.8	39.42	-	-	74	-34.58	0-360	200	V
1	1.315	33.59	РК	29.7	-23.8	39.49	-	-	74	-34.51	0-360	200	Н
5	5.983	30.1	PK	35.2	-30.5	34.8	-	-	-	-	0-360	200	V
2	6.007	30.63	PK	35.2	-30.1	35.73	-	-	-	-	0-360	200	Н
6	10.355	27.21	PK	37.2	-25.7	38.71	-	-	-	-	0-360	200	V
3	10.378	26.97	PK	37.2	-25.7	38.47	-	-	-	-	0-360	200	Н

PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

Page 88 of 99

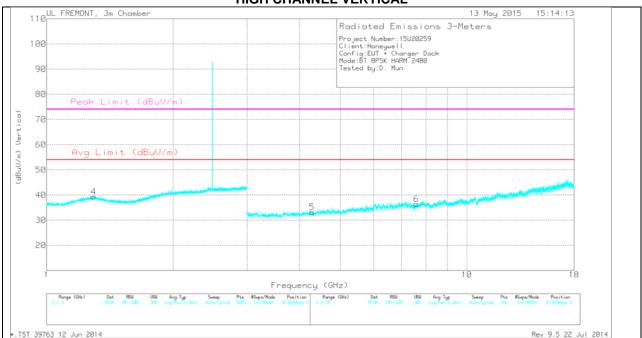
#### **HIGH CHANNEL HORIZONTAL**



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 89 of 99

#### HIGH CHANNEL VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Page 90 of 99

### **HIGH CHANNEL DATA**

TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.294	33.3	PK	29.8	-23.8	39.3	-	-	74	-34.7	0-360	200	V
1	1.296	33.52	PK	29.8	-23.8	39.52	-	-	74	-34.48	0-360	200	Н
5	4.281	30.79	PK	33.5	-31.1	33.19	-	-	74	-40.81	0-360	100	V
2	4.293	31.06	PK	33.5	-31.1	33.46	-	-	74	-40.54	0-360	100	Н
6	7.588	28.78	PK	35.7	-28.1	36.38	-	-	74	-37.62	0-360	100	V
3	7.589	28.92	PK	35.7	-28.1	36.52	-	-	74	-37.48	0-360	100	Н

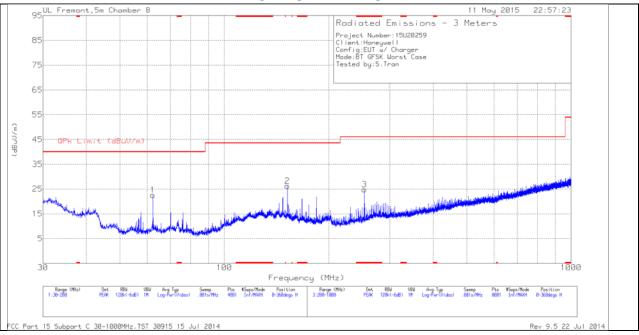
PK - Peak detector

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

Page 91 of 99

# 9.3. WORST-CASE BELOW 1 GHz

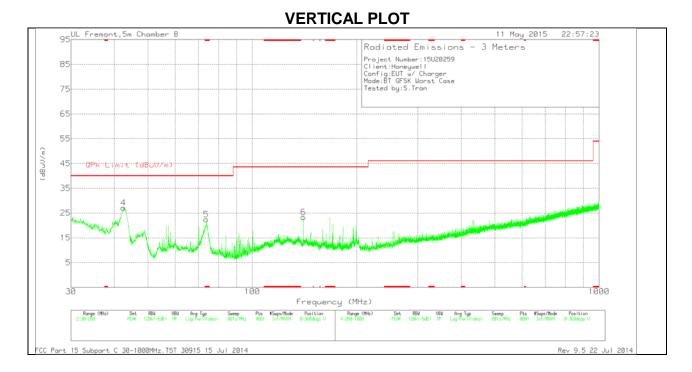
# GFSK SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



# HORIZONTAL PLOT

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Page 92 of 99



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Page 93 of 99

# **BELOW 1 GHz TABLE**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 73.7325	42.83	РК	8	-28.4	22.43	40	-17.57	0-360	101	V
3	* 253.6	39.5	РК	11.7	-26.4	24.8	46.02	-21.22	0-360	101	Н
4	42.495	43.5	РК	12.3	-28.7	27.1	40	-12.9	0-360	101	V
1	62.2575	43.3	РК	7.7	-28.5	22.5	40	-17.5	0-360	300	Н
6	140.5	37.93	РК	13	-27.6	23.33	43.52	-20.19	0-360	101	V
2	151.9325	41.31	РК	12.4	-27.5	26.21	43.52	-17.31	0-360	300	Н

\* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

Page 94 of 99

# **10. AC POWER LINE CONDUCTED EMISSIONS**

# <u>LIMITS</u>

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted I	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.

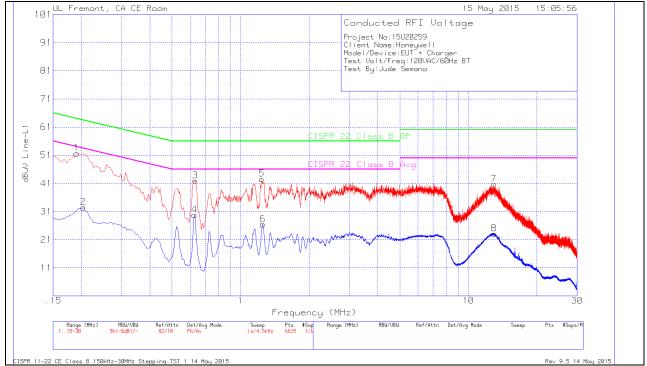
Line conducted data is recorded for both NEUTRAL and HOT lines.

<u>RESULTS</u>

Page 95 of 99

# **<u>6 WORST EMISSIONS</u>**

# LINE 1 PLOT



# **LINE 1 RESULTS**

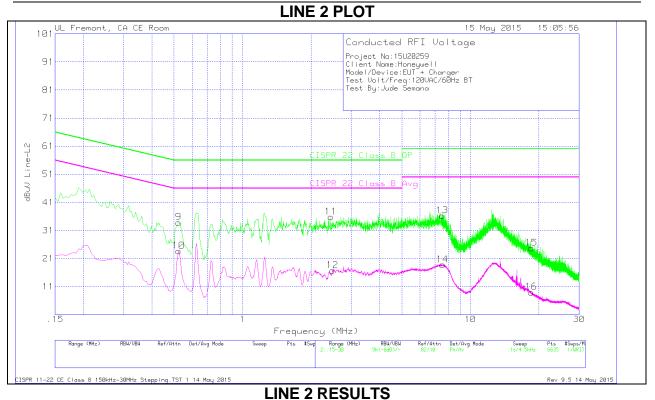
Range 1	: Line-L1 .15	- 30MHz								
Marker	Frequency	Meter	Det	T24 IL L1	LC Cables	Corrected	CISPR 22	Margin	CISPR 22	Margin
	(MHz)	Reading			1&3	Reading	Class B QP	(dB)	Class B	(dB)
		(dBuV)				dBuV			Avg	
1	.1905	50.63	Pk	1	0	51.63	64.01	-12.38		
2	.204	31.52	Av	.9	0	32.42	-	-	53.45	-21.03
3	.6315	41.63	Pk	.3	0	41.93	56	-14.07		
4	.627	29.47	Av	.3	0	29.77	-	-	46	-16.23
5	1.239	42.35	Pk	.2	0	42.55	56	-13.45		
6	1.2525	26.27	Av	.2	0	26.47	-	-	46	-19.53
7	12.939	40.29	Pk	.2	.2	40.69	60	-19.31		
8	12.9525	22.7	Av	.2	.2	23.1	-	-	50	-26.9

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Page 96 of 99

### REPORT NO: 15U20259-E8 FCC ID: HD5-CT50L0N

# DATE: JUNE 05, 2015 IC ID:1693B-CT50L0N



#### Range 2: Line-L2 .15 - 30MHz

Marker	Frequency	Meter	Det	T24 IL L2	LC Cables	Corrected	CISPR 22	Margin	CISPR 22	Margin
	(MHz)	Reading			2&3	Reading	Class B QP	(dB)	Class B	(dB)
		(dBuV)				dBuV			Avg	
9	.5235	33.42	Pk	.4	0	33.82	56	-22.18		
10	.5235	23.24	Av	.4	0	23.64	-	-	46	-22.36
11	2.4405	35.5	Pk	.2	.1	35.8	56	-20.2		
12	2.481	16.42	Av	.2	.1	16.72	-	-	46	-29.28
13	7.5165	35.94	Pk	.2	.1	36.24	60	-23.76		
14	7.539	18.48	Av	.2	.1	18.78	-	-	50	-31.22
15	18.4965	24.23	Pk	.3	.2	24.73	60	-35.27		
16	18.4875	8.49	Av	.3	.2	8.99	-	-	50	-41.01
10	10.4075	0.45	7.0		.2	0.55			5	5

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Page 97 of 99