FCC 47 CFR PART 15 SUBPART C
ISED RSS-247 ISSUE 2
ISED RSS-GEN ISSUE 4

CERTIFICATION TEST REPORT

FOR

WIRELESS MODULE

MODEL NUMBER: 424821

FCC ID: A94424821
IC: 3232A-424821

REPORT NUMBER: R12053557-E10

ISSUE DATE: 2018-06-06

Prepared for
BOSE CORPORATION
100 THE MOUNTAIN ROAD
FRAMINGHAM, MA 01701, USA

Prepared by
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NVLAP LAB CODE 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2018-04-24	Initial Issue	Brian T. Kiewra
2	2018-05-23	Added 'ac' to Section 5.1. Added reference to monitor and headphones in Section 5.5. Added calibration note to Section 6.	Brian T. Kiewra
3	2018-05-31	Simultaneous Transmission statement added to Section 5.5.	Brian T. Kiewra
4	2018-06-06	Revised antenna description in Section 5.3	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Bose Corporation
100 The Mountain
Framingham, MA 01701, USA

EUT DESCRIPTION: Wireless Module

MODEL: 424821

SERIAL NUMBER: Radiated: 0122, 0180; Conducted: 0199

DATE TESTED: 2018-03-08 to 2018-04-11

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Compliant
ISED CANADA RSS-247 Issue 2	Compliant
ISED CANADA RSS-GEN Issue 4	Compliant

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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, or any agency of the U.S. Government.

Approved & Released
For UL LLC By:

Jeffrey Moser
Operations Leader
UL – Consumer Technology Division

Prepared By:

Brian T. Kiewra
Project Engineer
UL – Consumer Technology Division

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 C63.10-2013, RSS-GEN Issue 4, RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Drive, Suite B,Morrisville, NC 27560.

12 Laboratory Dr., RTP, NC 27709
☐ Chamber A
☐ Chamber C

2800 Perimeter Park Dr., Suite B, Morrisville, NC 27560
☒ Chamber NORTH
☒ Chamber SOUTH

The onsite chambers (A, C, North and South) are covered under Industry Canada company address code 2180C with site numbers 2180C -1 through 2180C-4, respectively.

UL LLC is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at https://www.nist.gov/nvlap.

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	Required by standard
Occupied Channel Bandwidth	2.00%	±5 %
RF output power, conducted	1.3 dB	±1,5 dB
Power Spectral Density, conducted	2.47 dB	±3 dB
Unwanted Emissions, conducted	2.94 dB	±3 dB
All emissions, radiated	5.36 dB	±6 dB
Temperature	2.26 °C	±3 °C
Supply voltages	2.40%	±3 %
Time	3.39%	±5 %

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a wireless module with 802.11a/b/g/n/ac , BT, and BLE capabilities.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	11.10	12.88
2402 - 2480	DQPSK	10.06	10.14
2402 - 2480	Enhanced 8PSK	10.49	11.19

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The module was tested with two different types external antennas; flexible and PCB trace antennas.

BT/BLE only transmits on Antenna 2

Etched PCB Antennas		
Frequency (MHz)	**Antenna Gain Antenna 1 (dBi)**	**Antenna Gain Antenna 2 (dBi)**
2.4GHz	3.34	1.61
5GHz	1.52	2.28

Two External Antennas			
Frequency (MHz)	**Antenna Gain (dBi)**	**Cable Loss (dB)**	**Net gain (dBi)**
2.4GHz	2.403	1.06	1.343
5GHz	3.994	1.83	2.164

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was PCS2.
The EUT driver software installed during testing was 2.1.2.9.
The test utility software used during testing was QRCT3 V6.1.29QPST.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions in range of 1-18GHz, EUT was set to transmit at low, a middle, and high channels. Radiated emissions <1GHz, >18GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

EUT was populated with headphones and monitor to maximize emissions.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y, and Z using both external and etched PCB antenna configurations. It was determined that X orientation was worst-case orientation for PCB antenna configuration and Y orientation was worst-case orientation for external antenna configuration. Therefore, all final radiated testing was performed with the EUT in X orientation for PCB antennas and Y orientation for external antennas.

DQPSK is represented by 8DPSK in some cases and DH5 testing represents DH1 and DH3.

Simultaneous transmission of BT/2.4GHz and BT/5GHz was investigated. Device was found to still be compliant.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Lenovo	T450	PC0A2QUS	N/A
Monitor	ViewSonic	VS15562	TVT171081663	N/A
AC/DC Adaptor	Bose	S024RU1700100	344666-0020	N/A

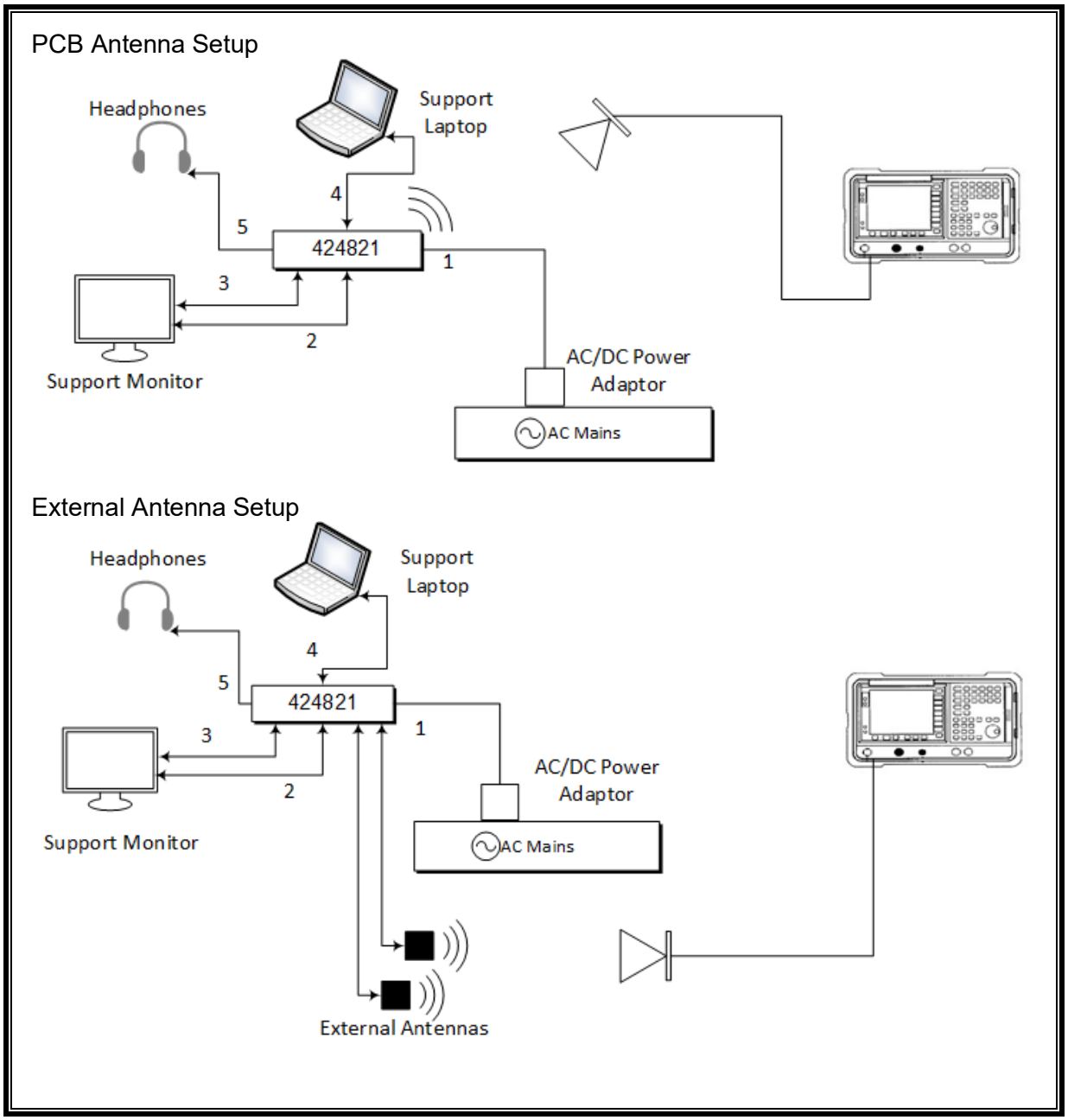
I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	AC/ DC Adaptor	DC Mains	<3m	None
2	HDMI	1	HDMI	HDMI	<3m	Connects to monitor
3	Audio	2	3.5mm plug	Audio	<3m	Connects to monitor
4	USB	1	USB	USB	<3m	Connects to Laptop
5	Audio	2	3.5mm plug	Audio	<3m	Connects to headphones

TEST SETUP

EUT installed as a standalone device.

SETUP DIAGRAM FOR TESTS



Note: Conducted setups were the same, except spectrum analyzer was connected directly to the antenna port.

6. TEST AND MEASUREMENT EQUIPMENT

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

Note: All tests performed within equipment calibration intervals. Unless test date occurred between calibration intervals, in which case both calibrations intervals were included.

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz (Loop Ant.)					
AT0059	Active Loop Antenna	ETS-Lindgren	6502	2017-06-05	2018-06-05
30-1000 MHz					
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2017-07-18	2018-07-31
1-18 GHz					
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2017-04-05	2018-04-05
18-40 GHz					
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2017-10-10	2018-10-10
Gain-Loss Chains					
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2017-09-15	2018-09-15
N-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2017-06-11	2018-06-11
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2017-08-18	2018-08-18
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2017-03-03	2018-03-03
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2018-04-03	2019-04-03
Receiver & Software					
SA0027	Spectrum Analyzer	Agilent	N9030A	2017-03-16	2018-03-16
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
s/n 161024690	Environmental Meter	Fisher Scientific	15-077-963	2016-12-21	2018-12-21

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz (Loop Ant.)					
AT005	Active Loop Antenna	ETS-Lindgren	6502	2017-06-05	2018-06-05
Gain-Loss Chains					
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2017-09-15	2018-09-15
Receiver & Software					
SA0025	Spectrum Analyzer	Agilent	N9030A	2017-04-10	2018-04-10
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
s/n 161024887	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0020	Spectrum Analyzer	Agilent Technologies	E4446A	2017-04-25	2018-04-25
T177	Spectrum Analyzer	Agilent Technologies	E4446A	2017-03-30	2018-03-30
72822 (SA0019)	Spectrum Analyzer	Agilent Technologies	E4446A	2017-08-21	2018-08-21
PWM003	RF Power Meter	Keysight Technologies	N1911A	2017-07-14	2018-07-14
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2017-07-17	2018-07-17
PWS001	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2017-05-18	2018-05-18
SN 161016511	Environmental Meter	Fisher Scientific	15-077-963	2016-12-21	2018-12-21

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL076	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3476-240	2017-06-12	2018-06-12
s/n 160938893	Environmental Meter	Fisher Scientific	14-650-118	2016-11-02	2018-11-02
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2017-08-22	2018-08-22
PRE0101521 (75141)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2017-08-23	2018-08-23
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2017-06-12	2018-06-12
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2017-07-03	2018-07-03
LISN008	LISN, 50-ohm/50-uH, 2-conductor, 25A (For support gear only.)	Solar Electronics	8012-50-R-24-BNC	2017-08-22	2018-08-22

7. MEASUREMENT METHODS

Duty Cycle: KDB 558074 Zero-Span Spectrum Analyzer Method

20 dB BW: ANSI C63.10 Section 6.9.2.

99% Occupied Bandwidth: ANSI C63.10, Section 6.9.3

Hopping Frequency Separation: ANSI C63.10 Section 7.8.2

Number of Hopping Channels: ANSI C63.10 Section 7.8.3

Average Time of Occupancy: ANSI C63.10 Section 7.8.4

Output Power: ANSI C63.10 Section 7.8.5

Out-of-band emissions in non-restricted bands: ANSI C63.10 Section 7.8.6 & 7.8.8

Out-of-band emissions in restricted bands: ANSI C63.10:2013 Sections 6.3-6.6

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

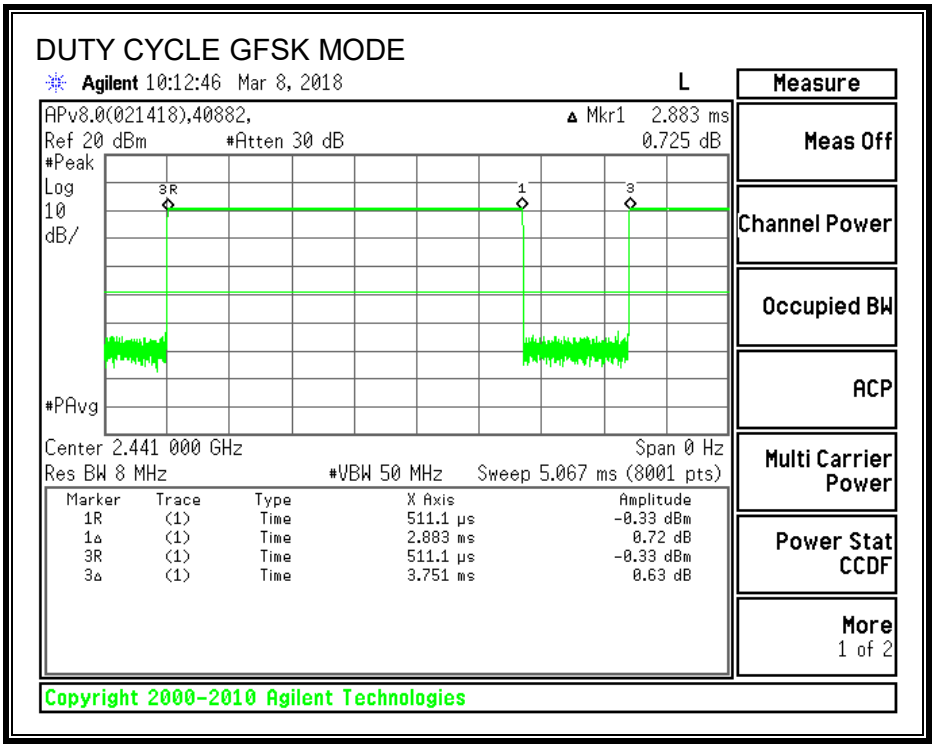
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4 GHz band						
GFSK	2.883	3.751	0.769	76.86%	2.29	0.347
8PSK	2.886	3.750	0.770	76.96%	2.27	0.347

TEST INFORMATION

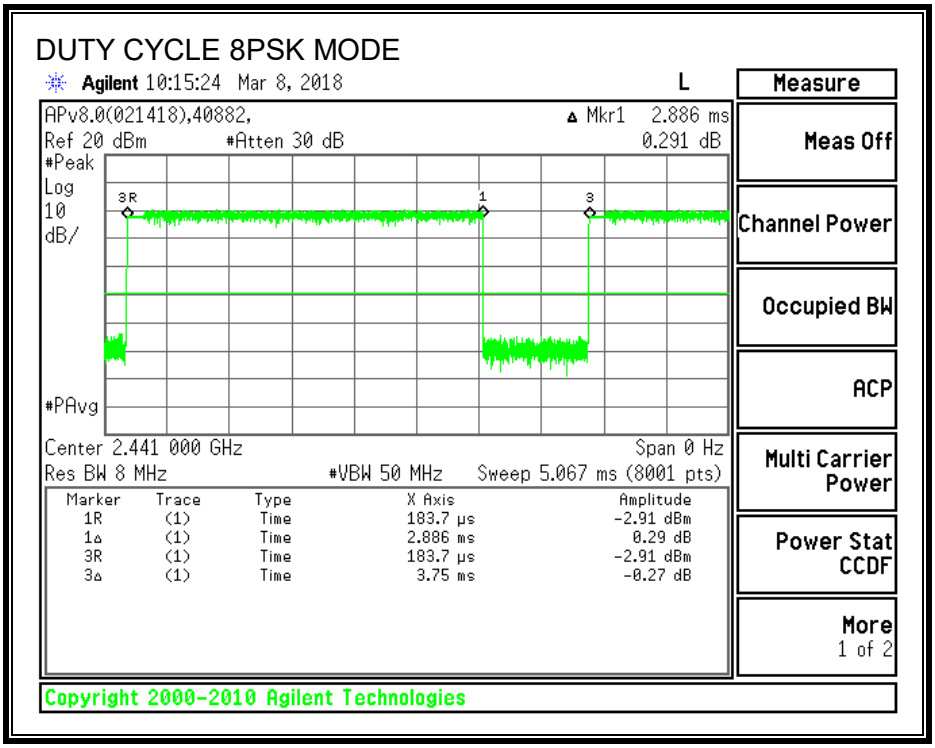
Test Date: 2018-03-08
Project: 12053557
Tested By: Jeffrey Cabrera

DUTY CYCLE PLOTS

DUTY CYCLE GFSK MODE



DUTY CYCLE 8PSK MODE



8.2. BASIC DATA RATE GFSK MODULATION

8.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.
Test per ANSI C63.10 Sections 6.9.2 and 6.9.3 and RSS-Gen 6.6.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1%-5% of the 20 dB bandwidth and 99% Occupied Bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

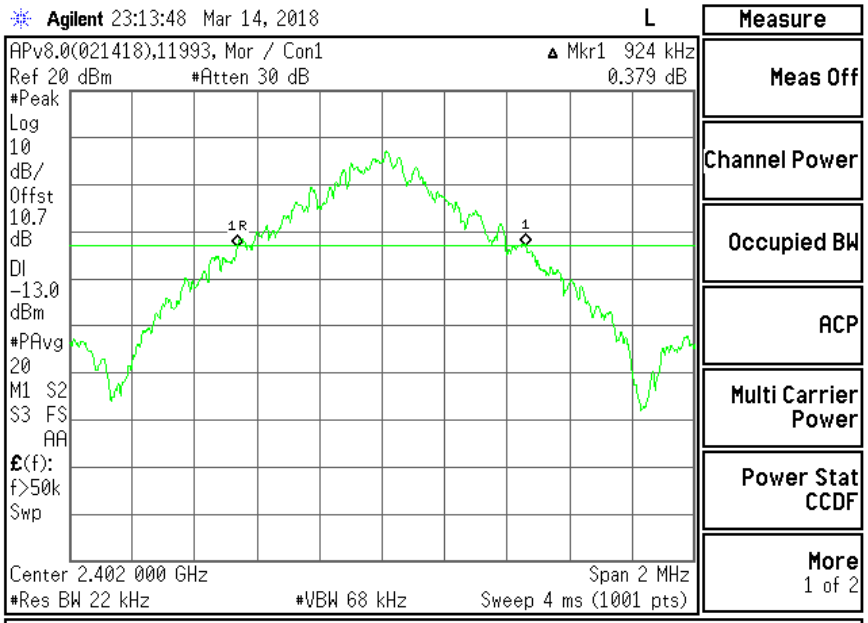
Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
2402	924	905.2879
2441	944	906.8079
2480	942	907.3012

TEST INFORMATION

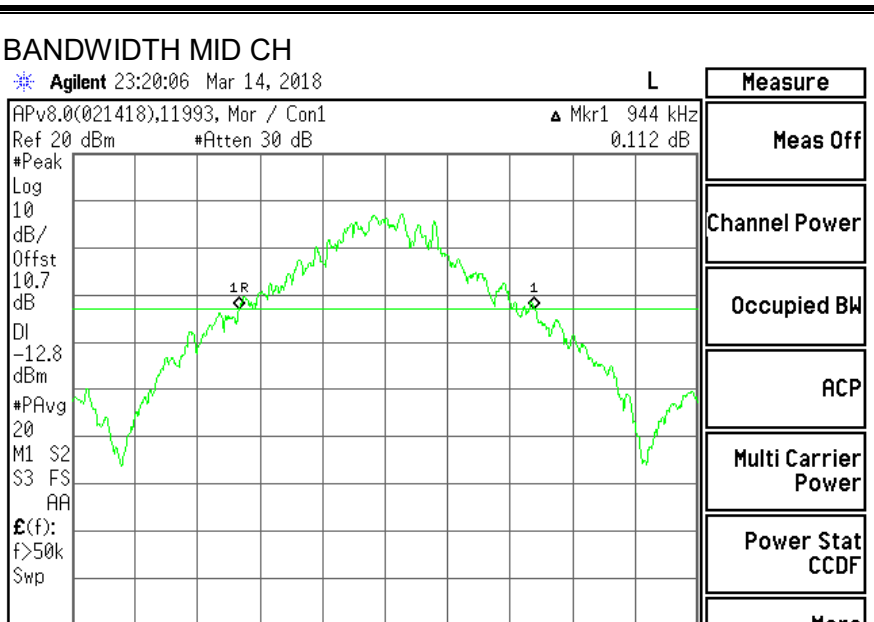
Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

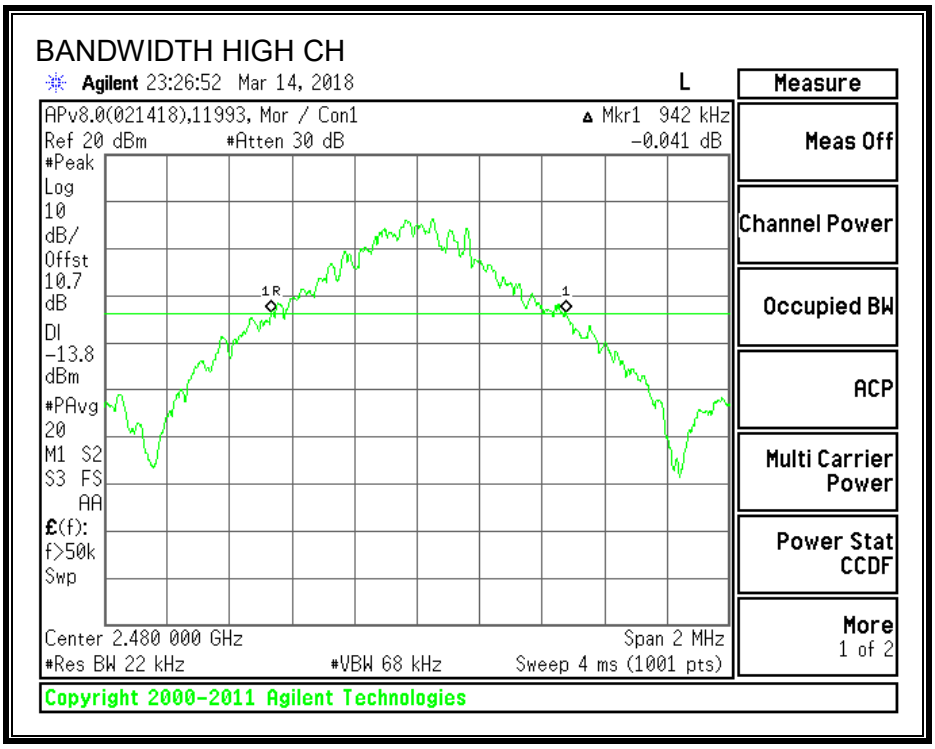
20 dB BANDWIDTH PLOTS

BANDWIDTH LOW CH

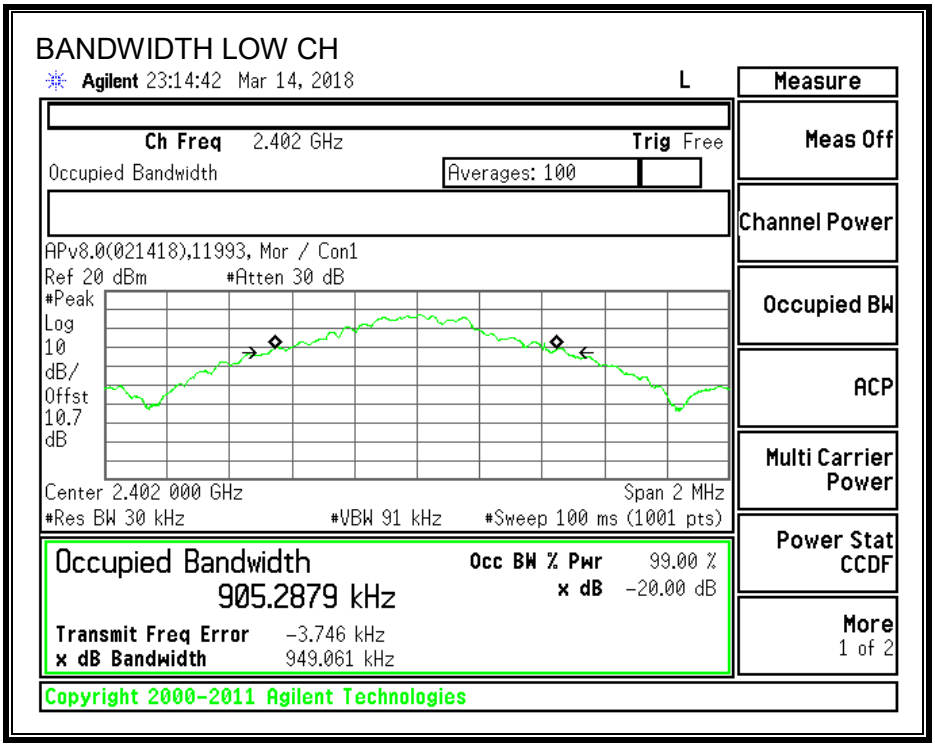


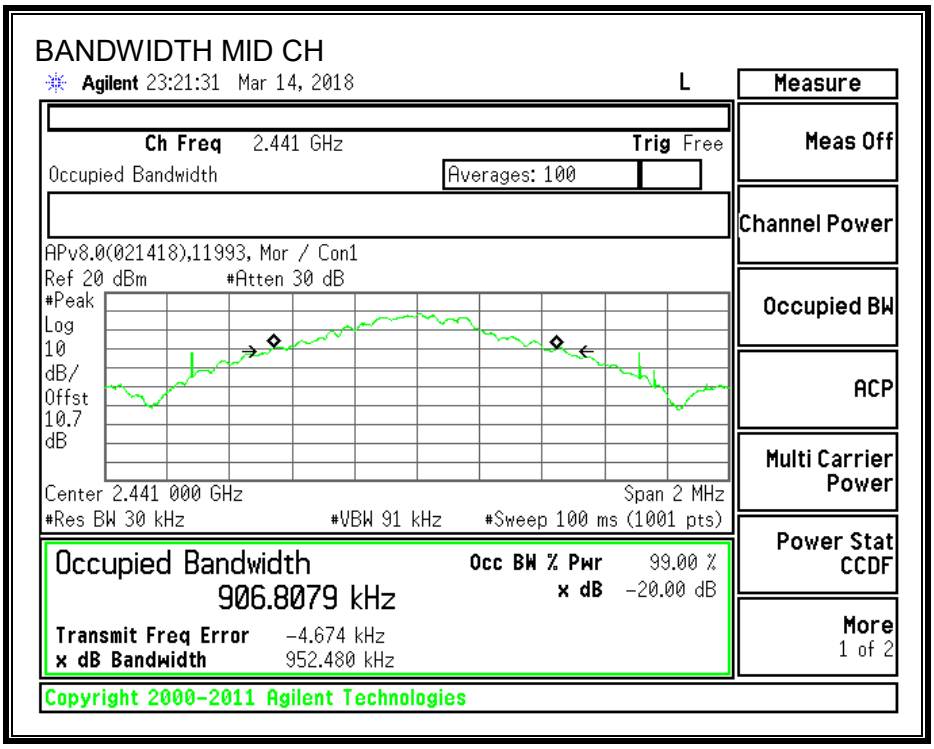
BANDWIDTH MID CH

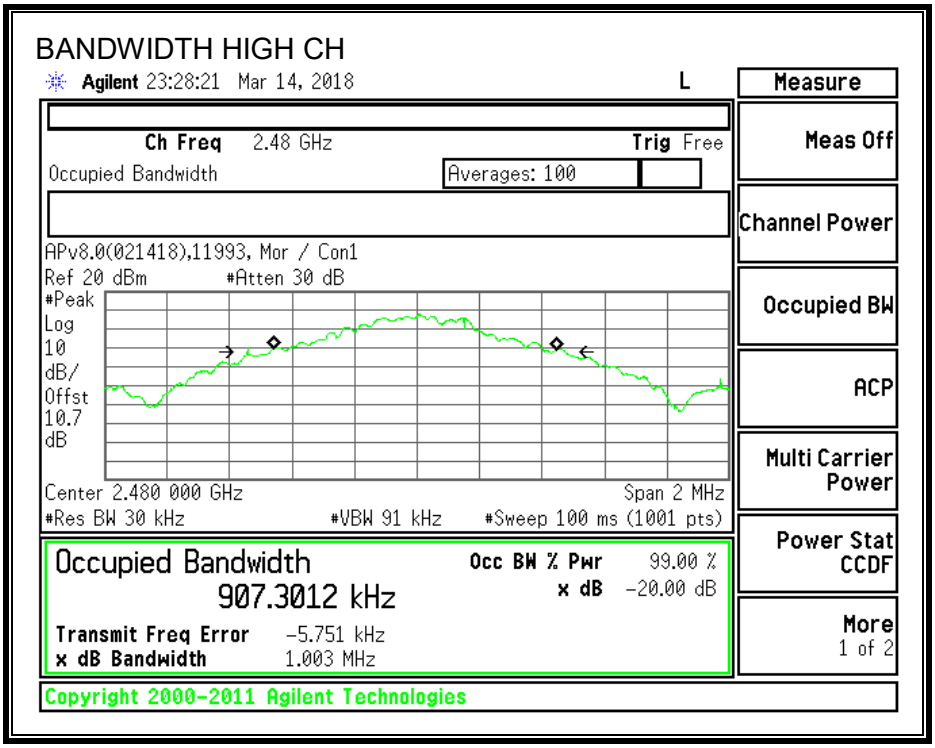




99% BANDWIDTH PLOTS







8.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-247 5.1 (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.

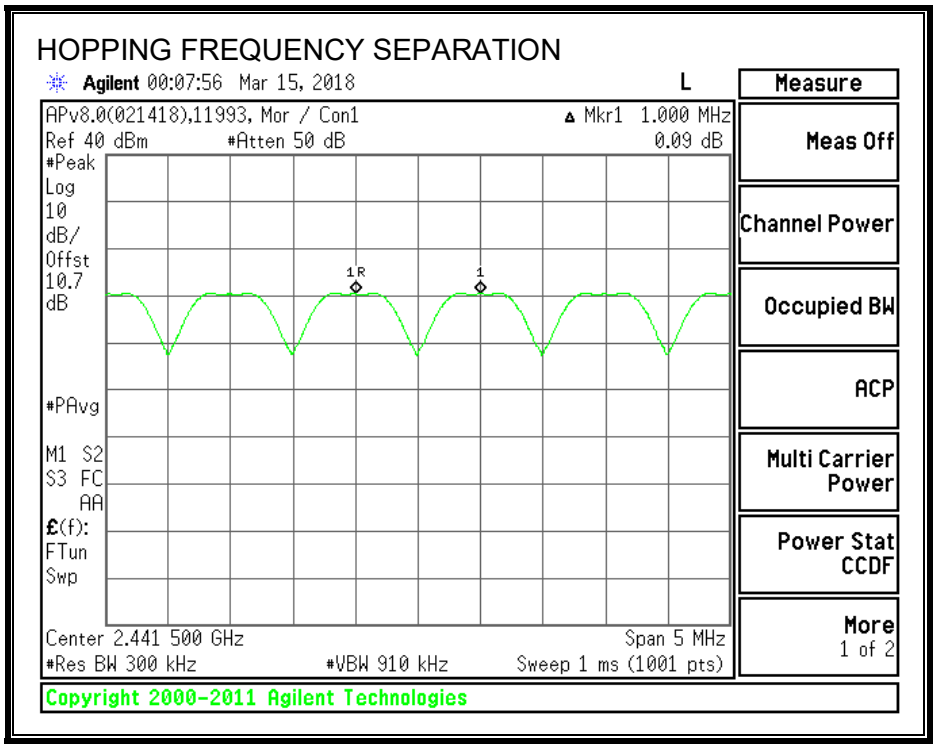
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to ≥ RBW. The sweep time is coupled.

TEST INFORMATION

Test Date: 2018-03-15
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

HOPPING FREQUENCY SEPARATION



Ch. A (MHz)	Ch. B (MHz)	Ch. 1 to Ch. 2 Sep. (MHz)	Max. 20 dB BW (MHz)	Margin (MHz)
2441	2442	1.000	0.944	-0.056

8.2.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1 (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 for visibility of the entire span. Then, smaller spans are set to more clearly identify the channels. The RBW is set to 30% of the channel spacing (approx. 300kHz). The analyzer is set to Max Hold.

TEST INFORMATION

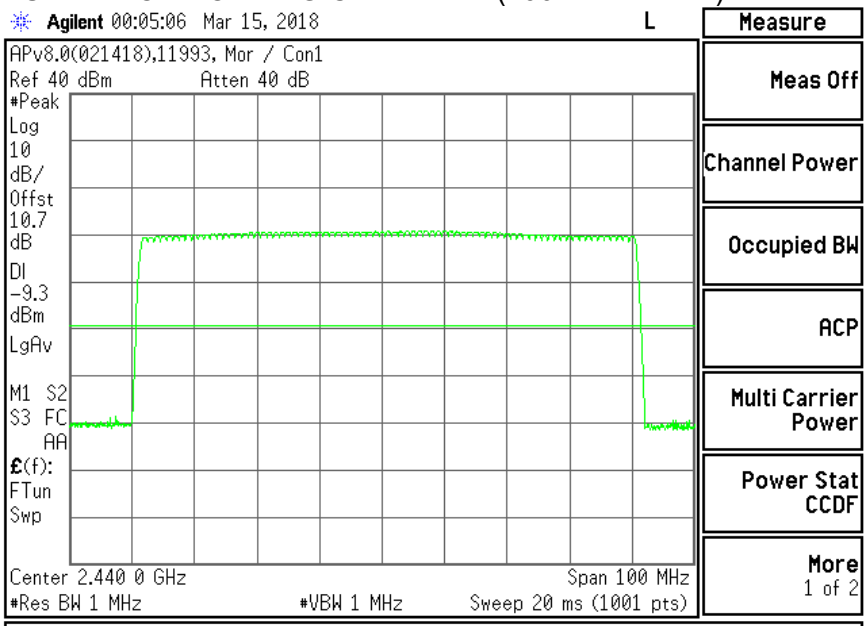
Test Date: 2018-03-15
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

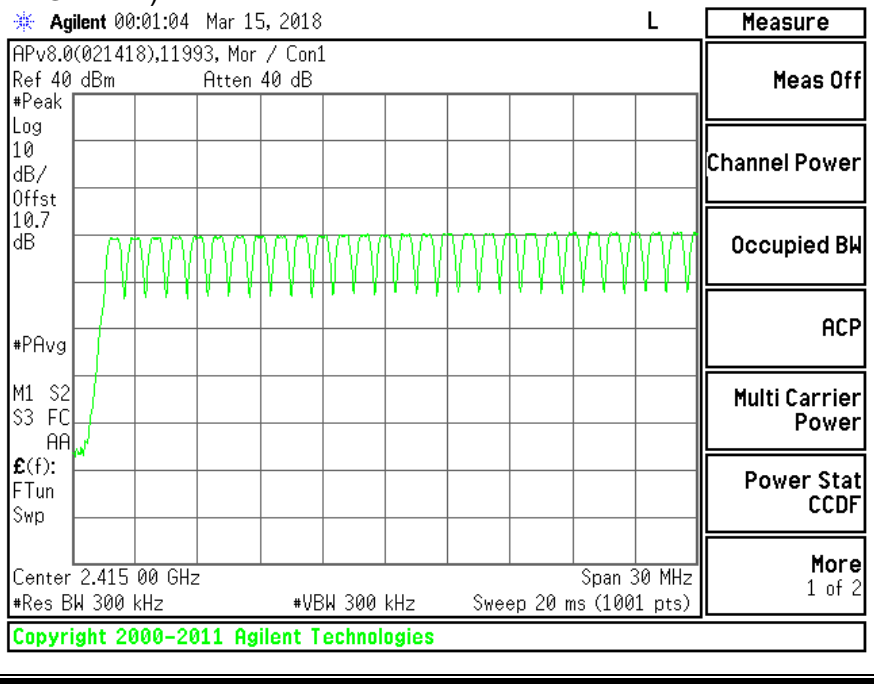
Normal Mode: 79 Channels observed.
AFH Mode: 15 Channels declared.

NUMBER OF HOPPING CHANNELS

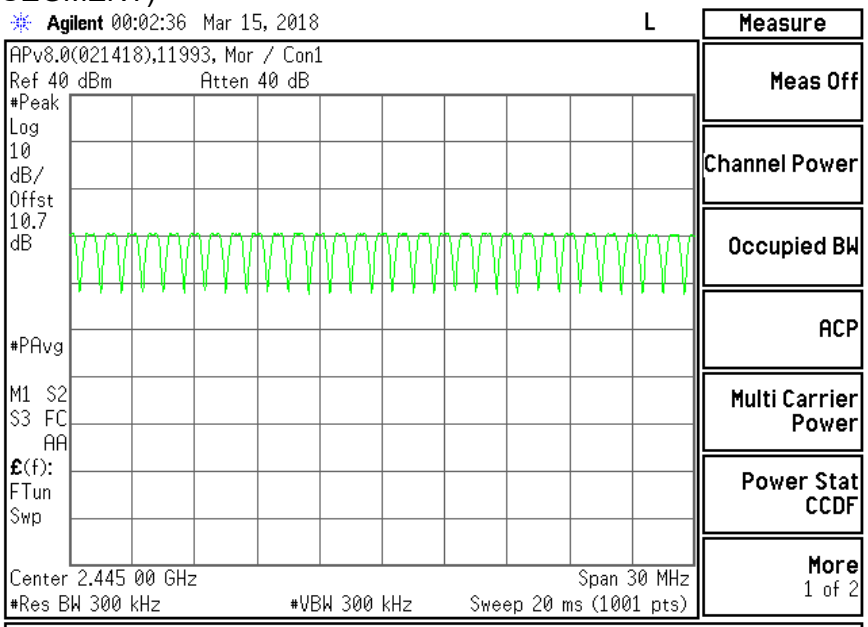
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



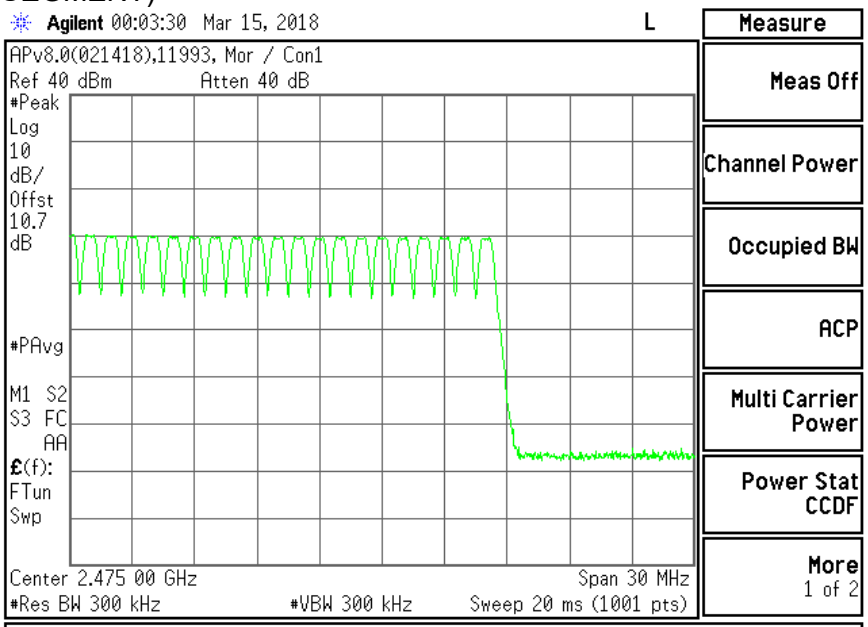
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



8.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1 (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.

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.

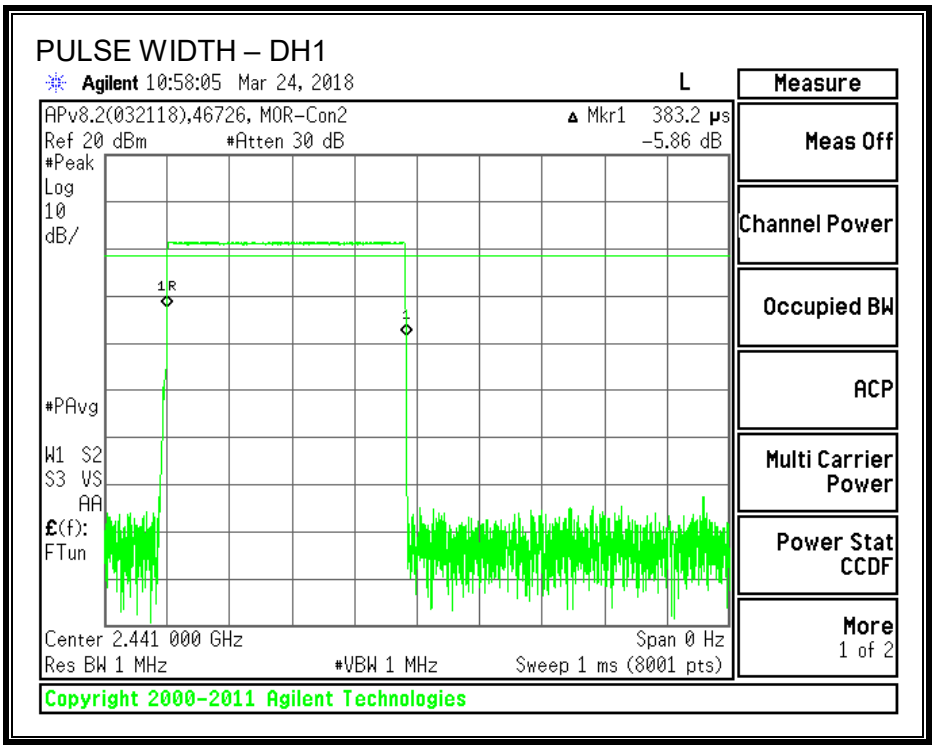
TEST INFORMATION

Test Date: 2018-03-14 and 2018-03-24
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon and Graham Allen / Niklas Haydon

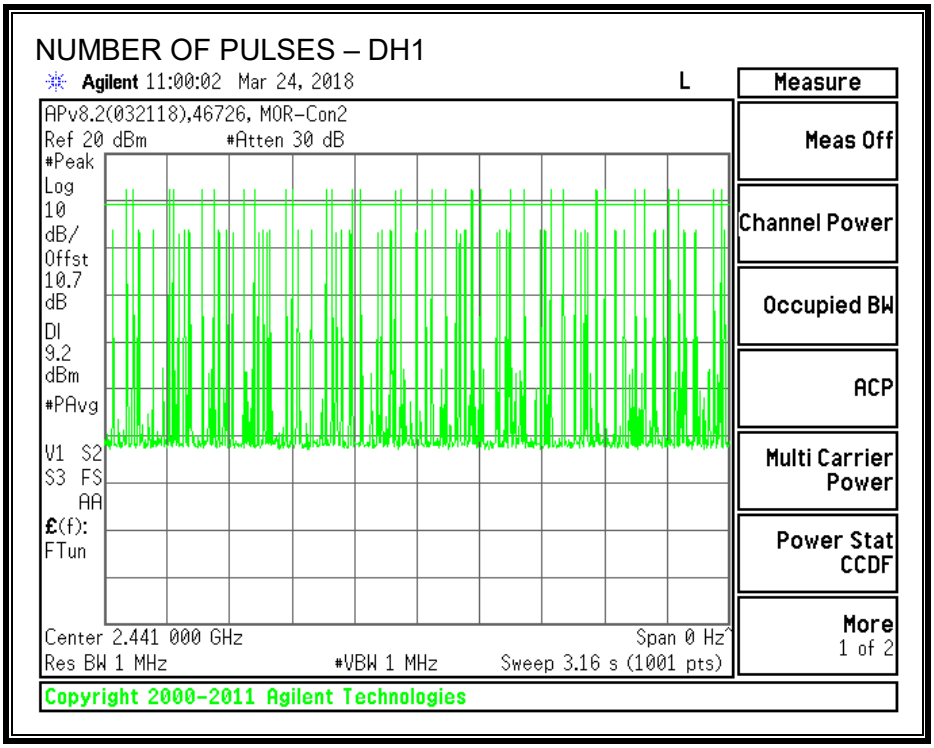
RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.3832	32	0.123	0.4	-0.277
DH3	1.639	16	0.262	0.4	-0.138
DH5	2.886	10	0.289	0.4	-0.111
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.3832	8	0.031	0.4	-0.369
DH3	1.639	4	0.066	0.4	-0.334
DH5	2.886	2.5	0.072	0.4	-0.328

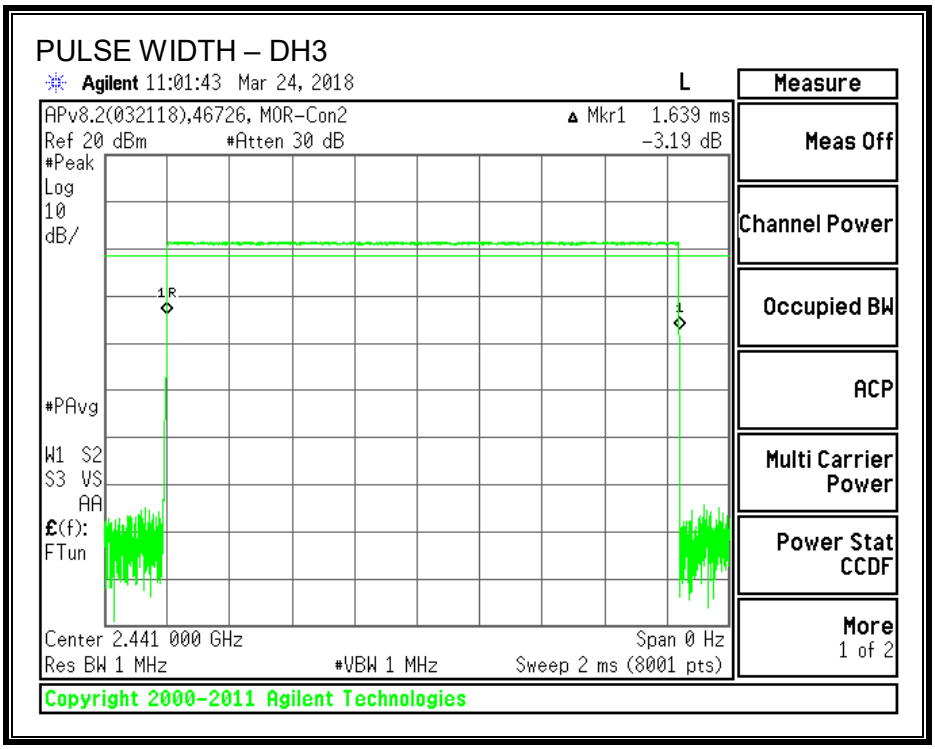
PULSE WIDTH – DH1



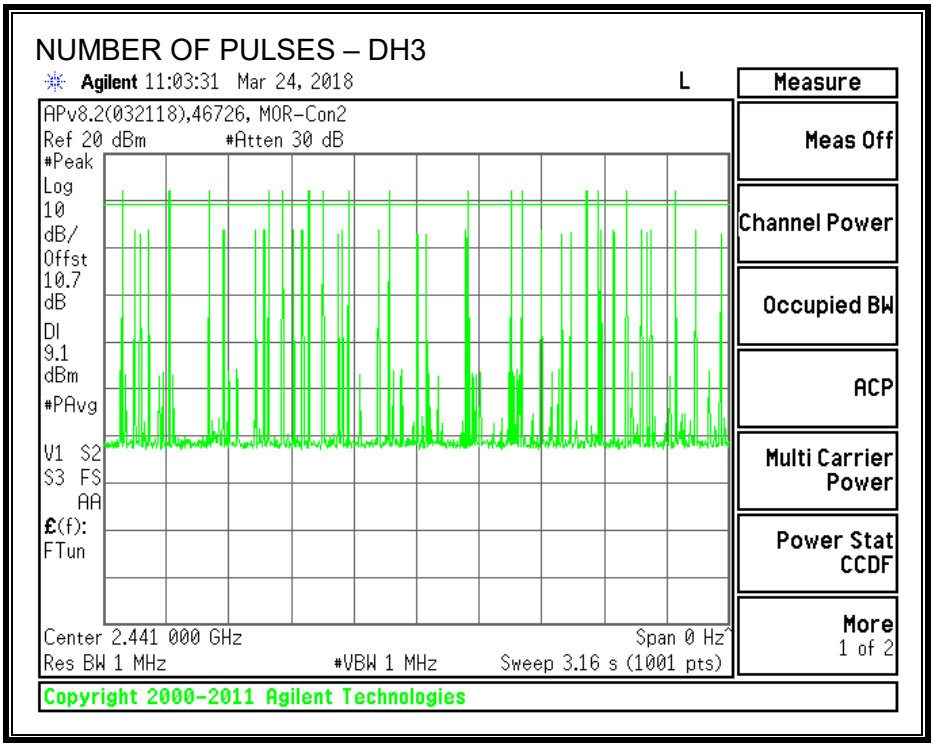
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



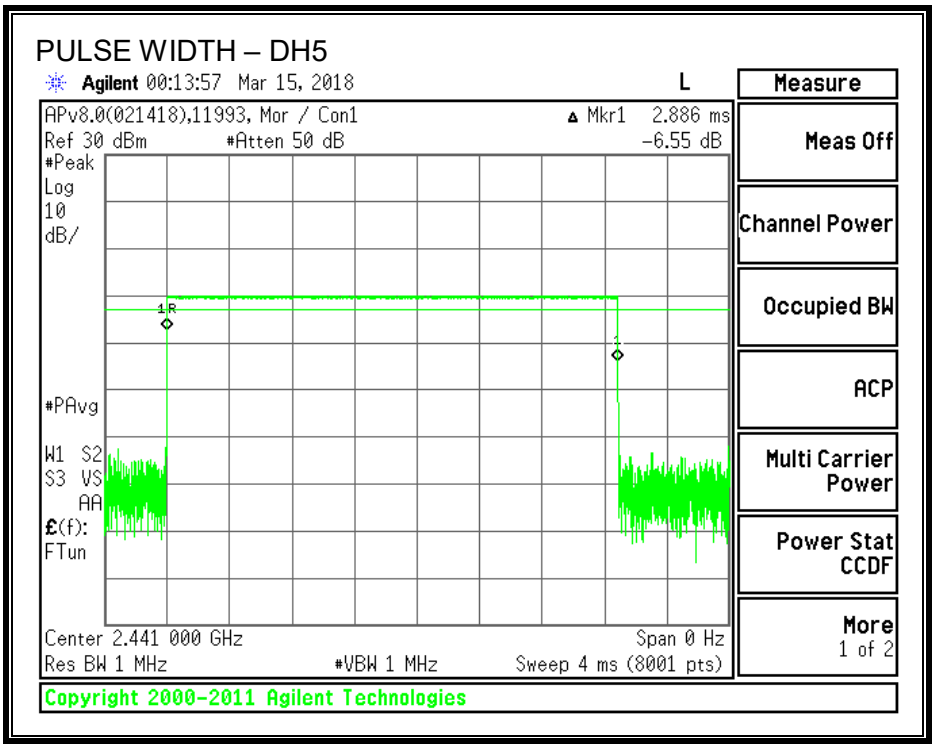
PULSE WIDTH – DH3



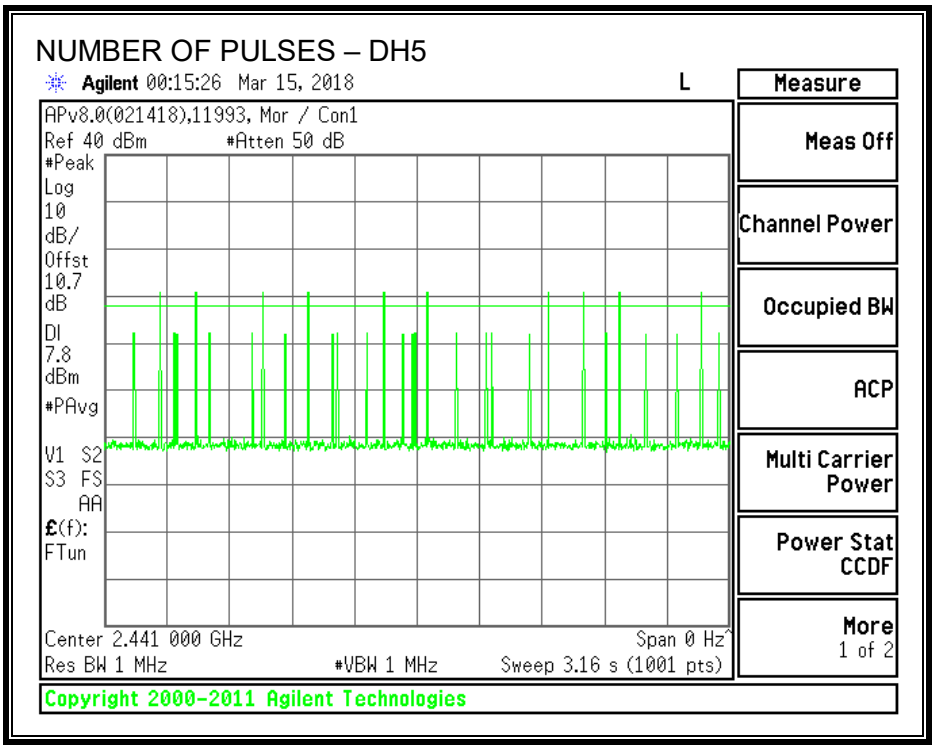
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



8.2.5. OUTPUT POWER – EXTERNAL ANTENNA

LIMIT

§15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 5.4 (b)

For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST INFORMATION

Test Date: 2018-03-15
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	9.73	1.34	30	-20.27
Middle	2441	11.10	1.34	30	-18.90
High	2480	9.93	1.34	30	-20.07

8.2.6. OUTPUT POWER – PCB ANTENNA

LIMIT

§15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 5.4 (b)

For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST INFORMATION

Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	9.73	1.61	30	-20.27
Middle	2441	11.10	1.61	30	-18.90
High	2480	9.93	1.61	30	-20.07

8.2.7. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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.

Frequency (MHz)	Average Power (dBm)
2402	9.53
2441	10.73
2480	9.73

TEST INFORMATION

Test Date: 2018-03-15
Project: 12053667
Tested By: Eric McCalister / Niklas Haydon

8.2.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

IC RSS-247 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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.

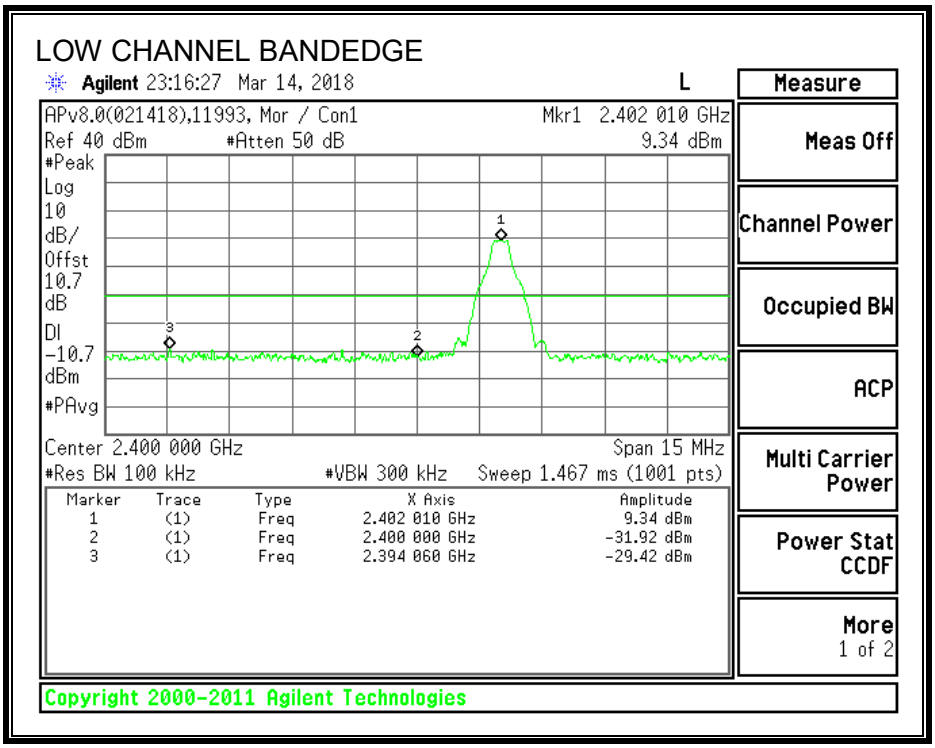
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

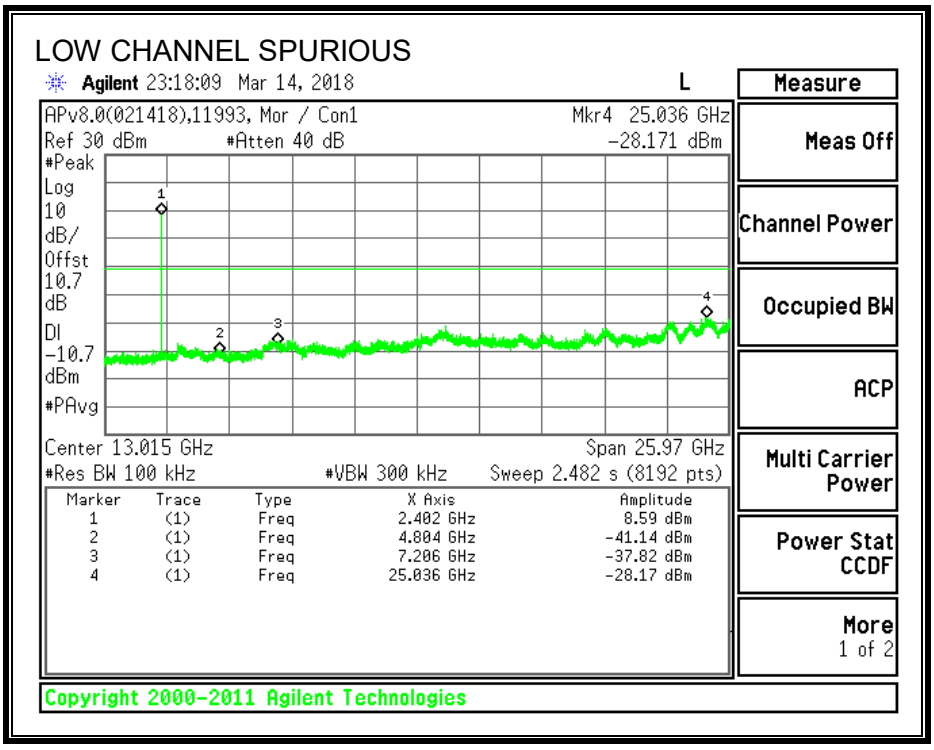
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

TEST INFORMATION

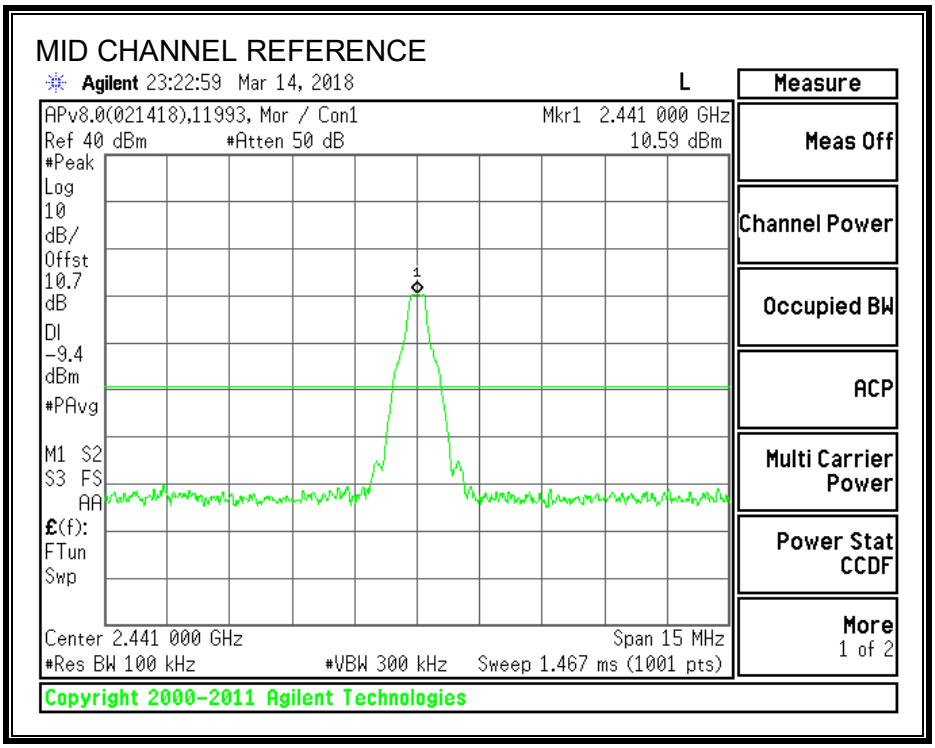
Test Date: 2018-03-14 and 2018-03-15
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

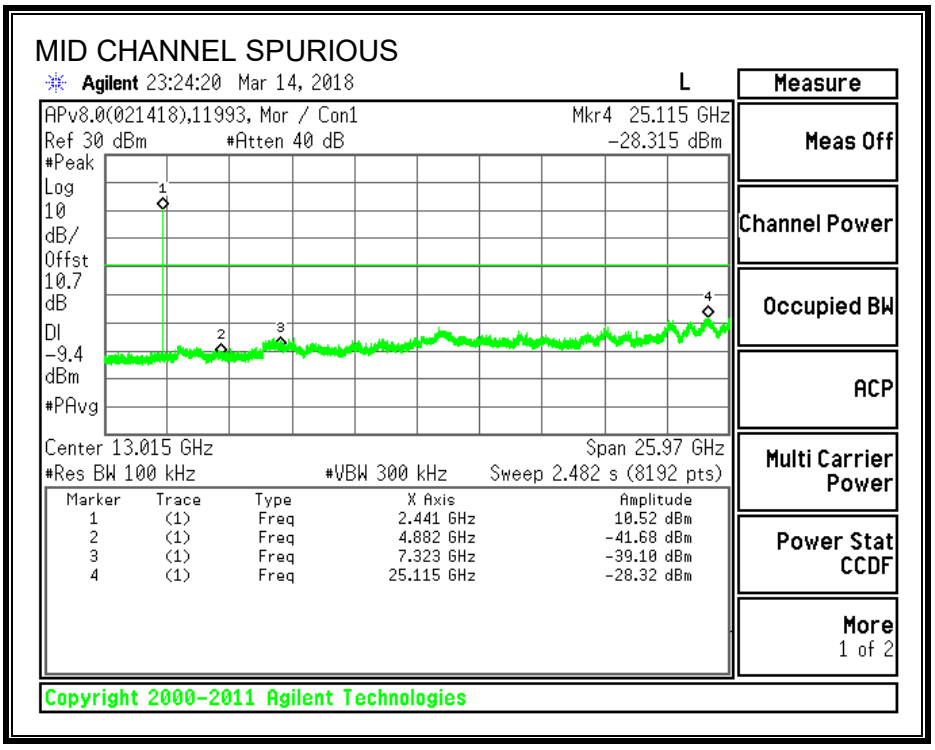
SPURIOUS EMISSIONS, LOW CHANNEL



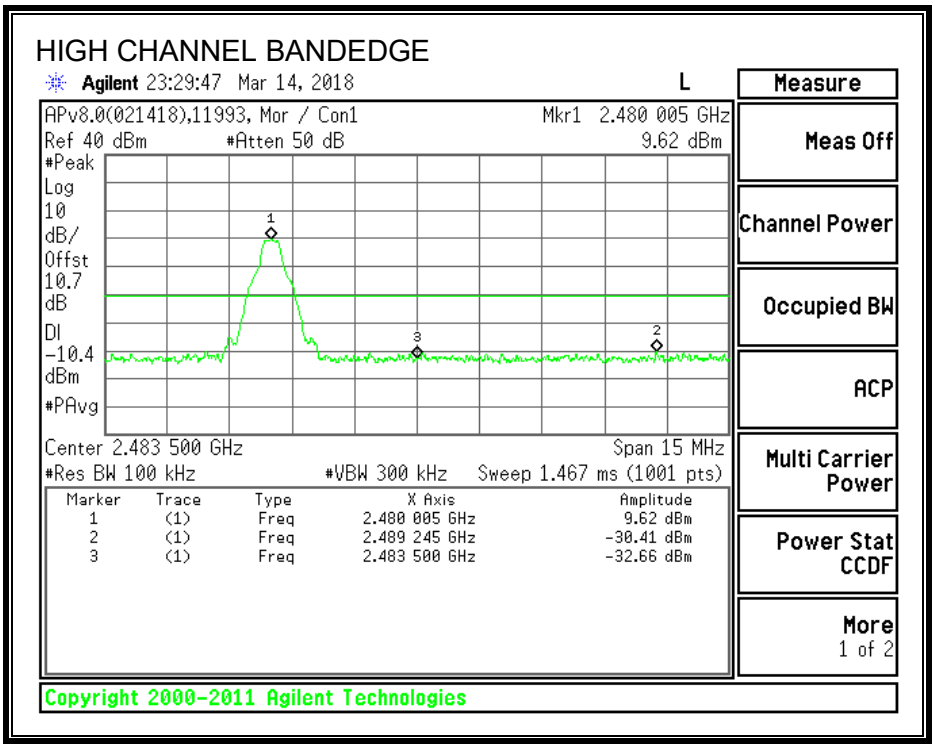


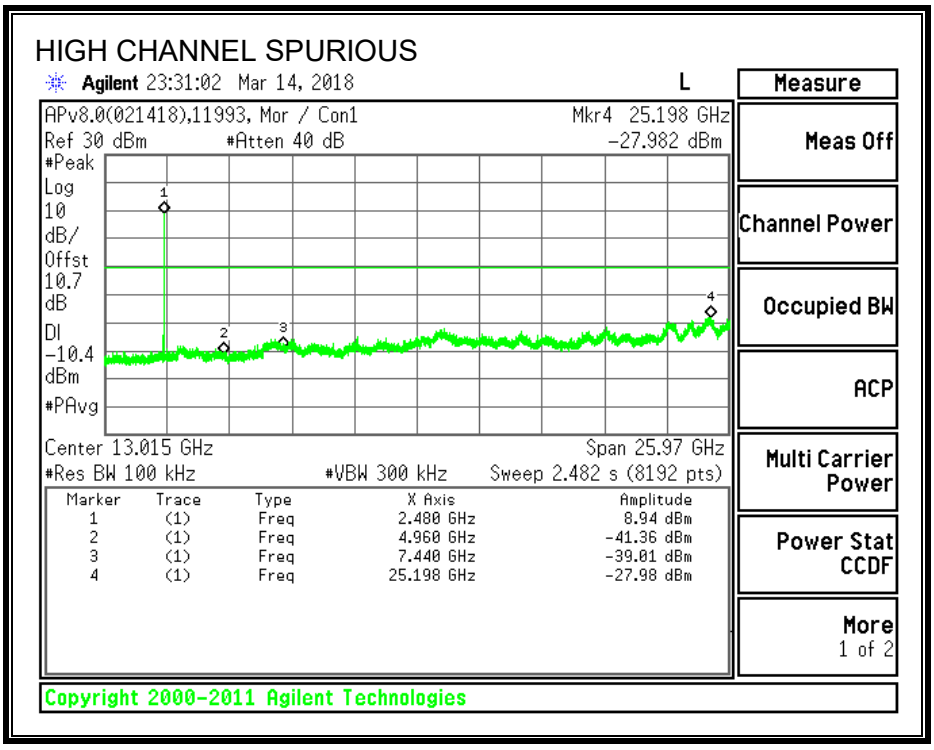
SPURIOUS EMISSIONS, MID CHANNEL





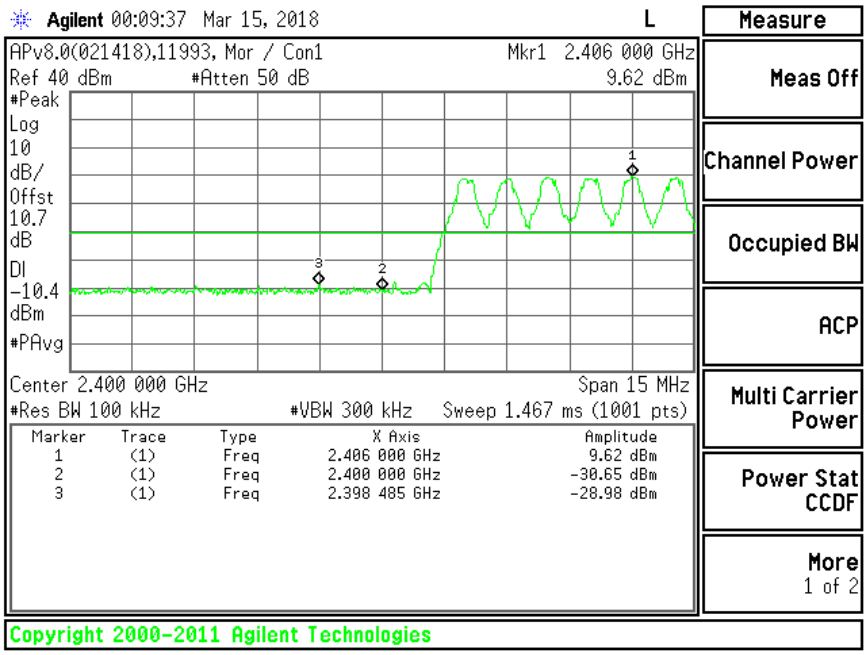
SPURIOUS EMISSIONS, HIGH CHANNEL



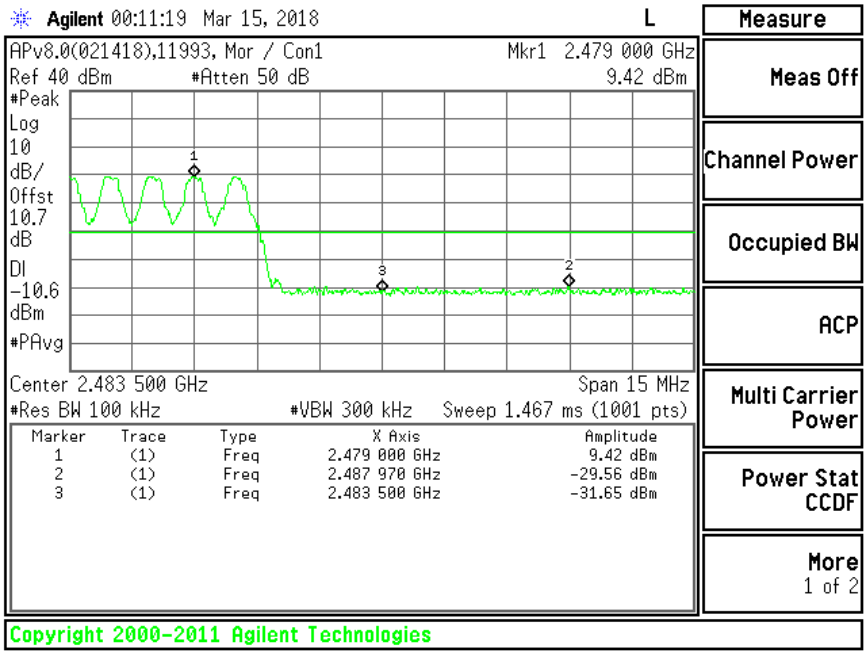


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



8.3. ENHANCED DATA RATE QPSK MODULATION

8.3.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.
Test per ANSI C63.10 Sections 6.9.2 and 6.9.3 and RSS-Gen 6.6.

TEST PROCEDURE

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

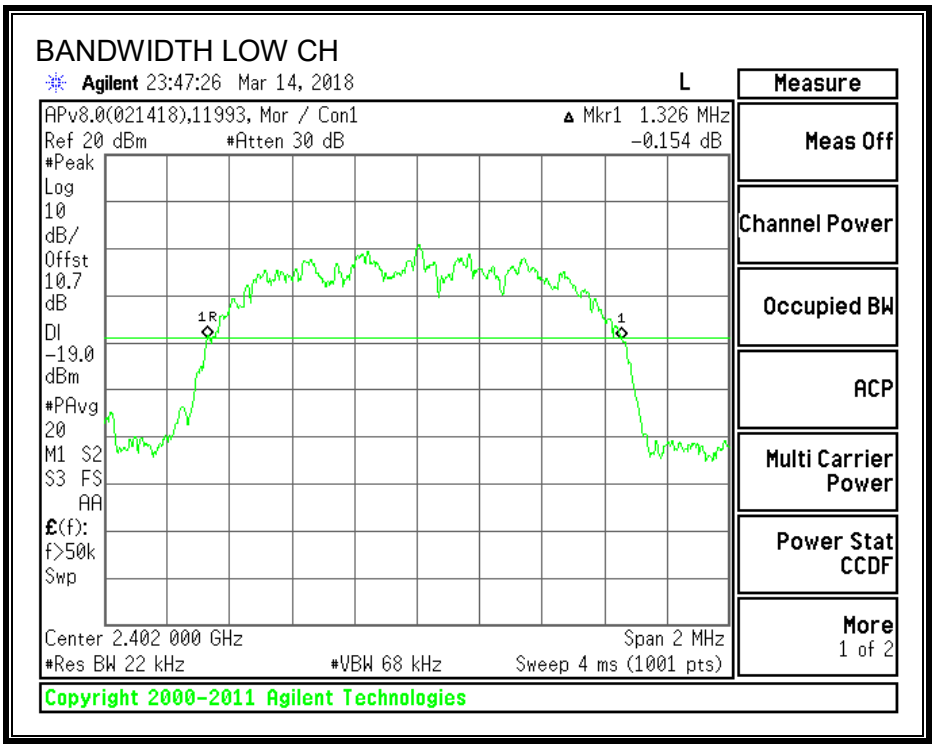
TEST INFORMATION

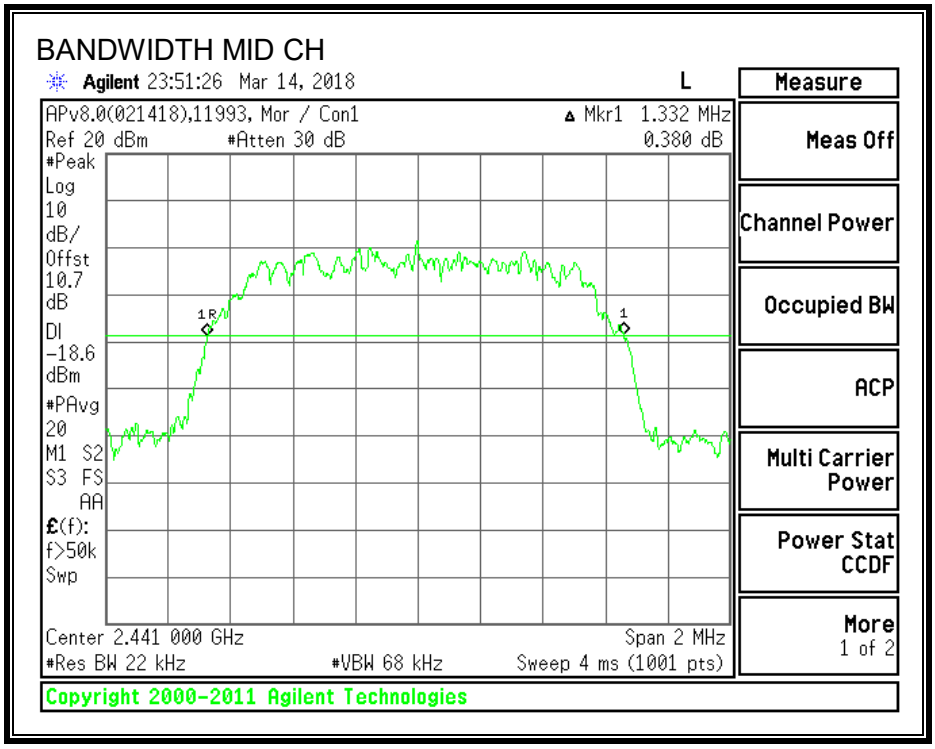
Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

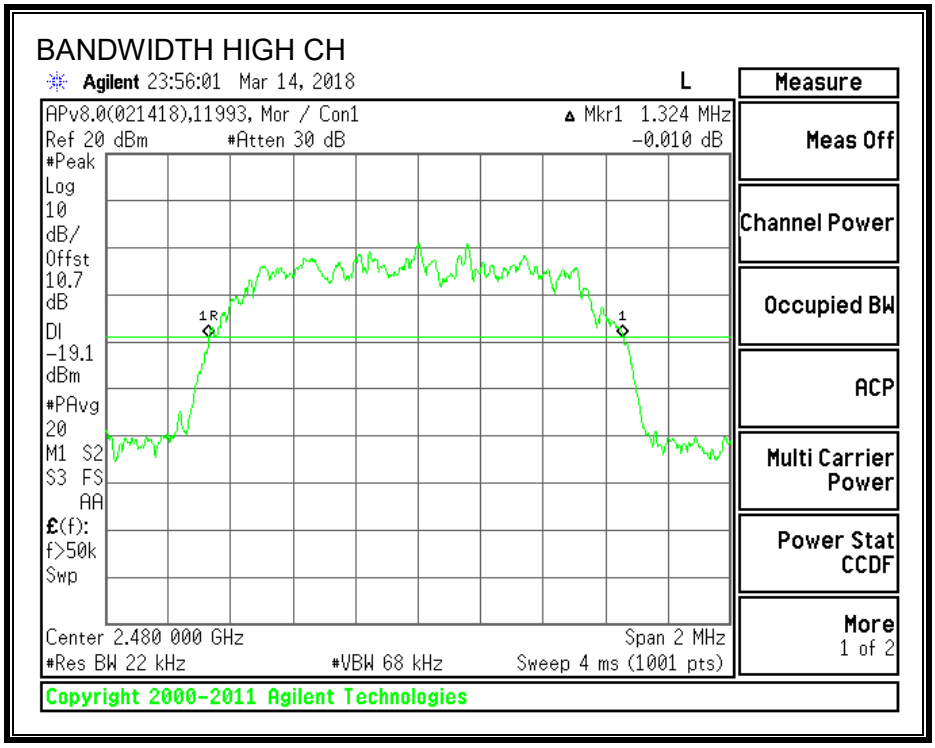
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.326	1.182
Middle	2441	1.332	1.183
High	2480	1.324	1.183

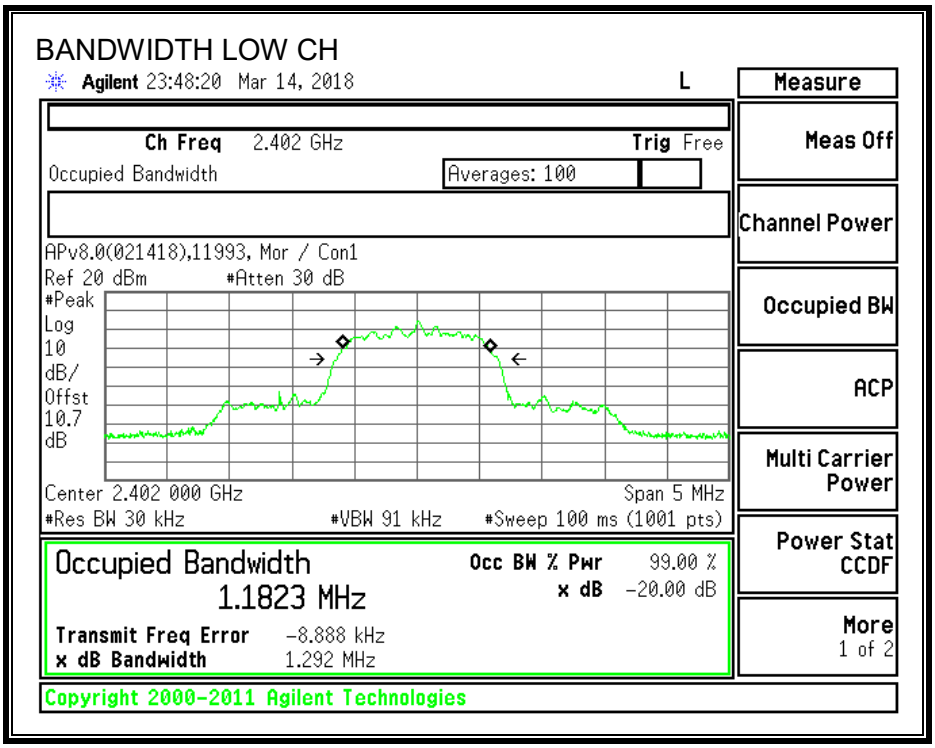
20 dB BANDWIDTH PLOTS

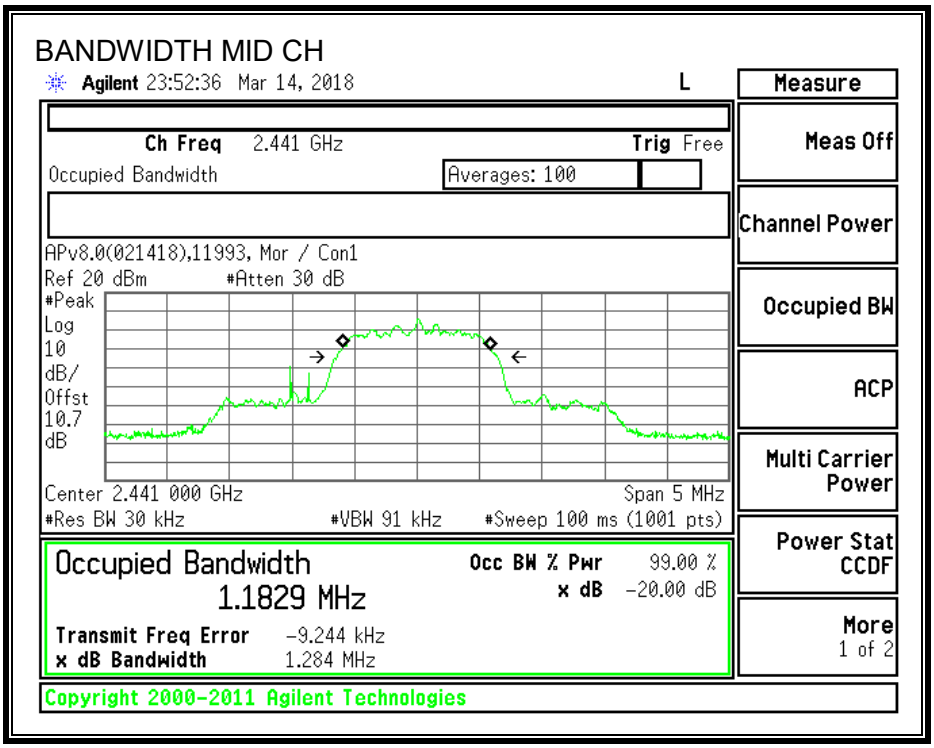


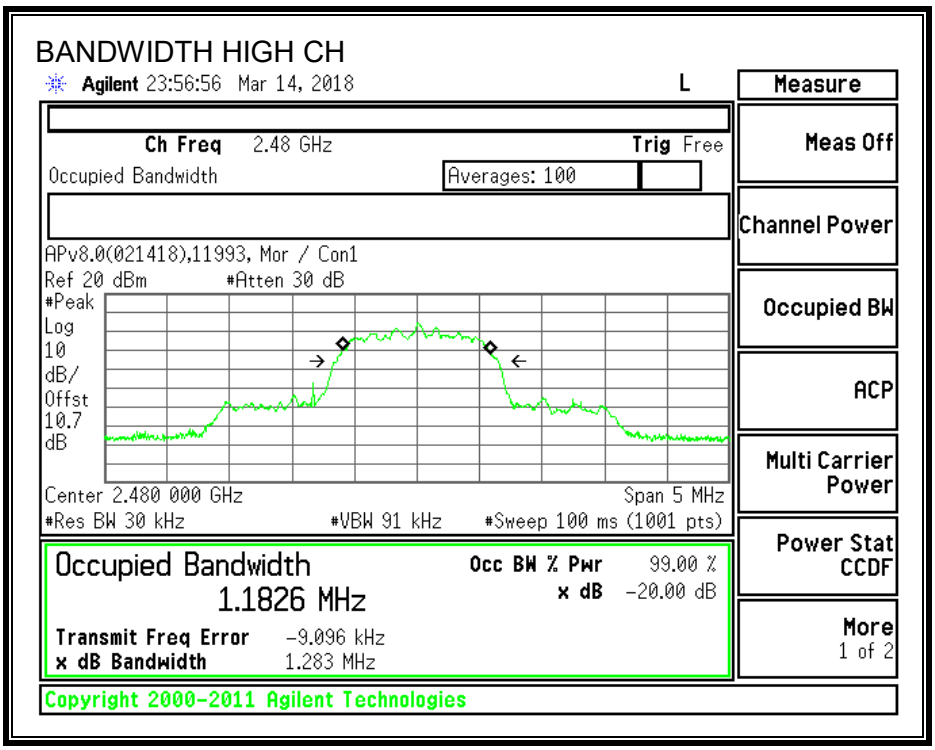




99% BANDWIDTH PLOTS







8.3.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-247 5.1 (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.

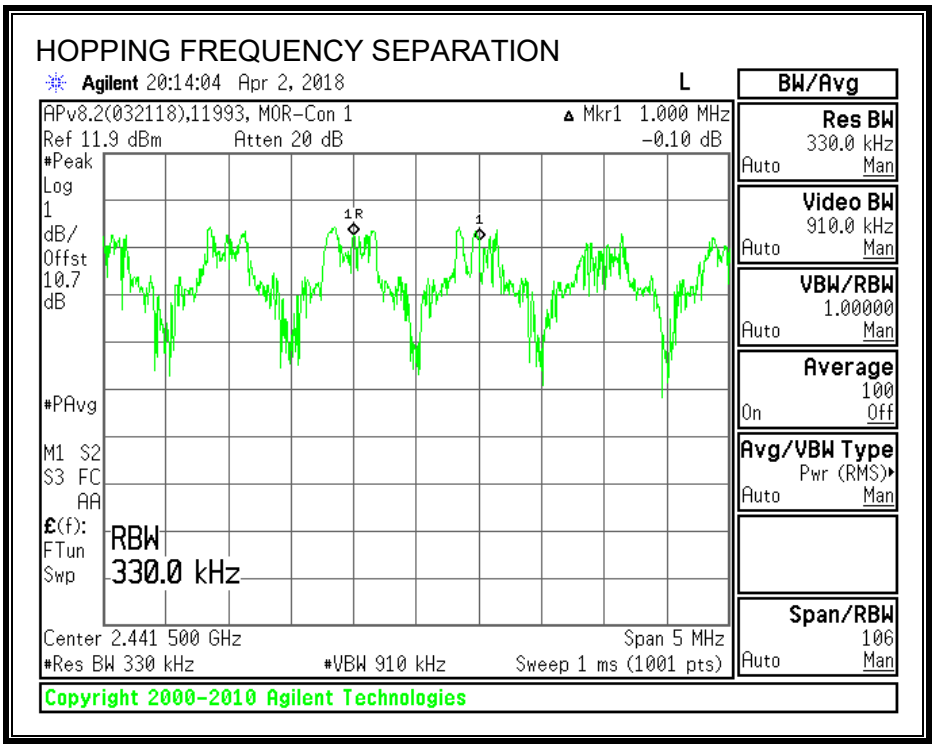
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to ≥ RBW. The sweep time is coupled.

TEST INFORMATION

Test Date: 2018-04-02
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

HOPPING FREQUENCY SEPARATION



Ch. A (MHz)	Ch. B (MHz)	Ch. 1 to Ch. 2 Sep. (MHz)	Max. 20 dB BW (MHz)	2/3 20 dB BW (MHz)	Margin (MHz)
2441	2442	1.000	1.332	0.888	-0.112

Note – The channel hopping separation of 1MHz is less than the 20 dB bandwidth (approx. 1.33 MHz). However, the output power is less than 125 mW and the channel separation is greater than 2/3 the 20 dB bandwidth (approx. 888 kHz).

8.3.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1 (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 for visibility of the entire span. Then, smaller spans are set to more clearly identify the channels. The RBW is set to 30% of the channel spacing (approx. 300 kHz). The analyzer is set to Max Hold.

TEST INFORMATION

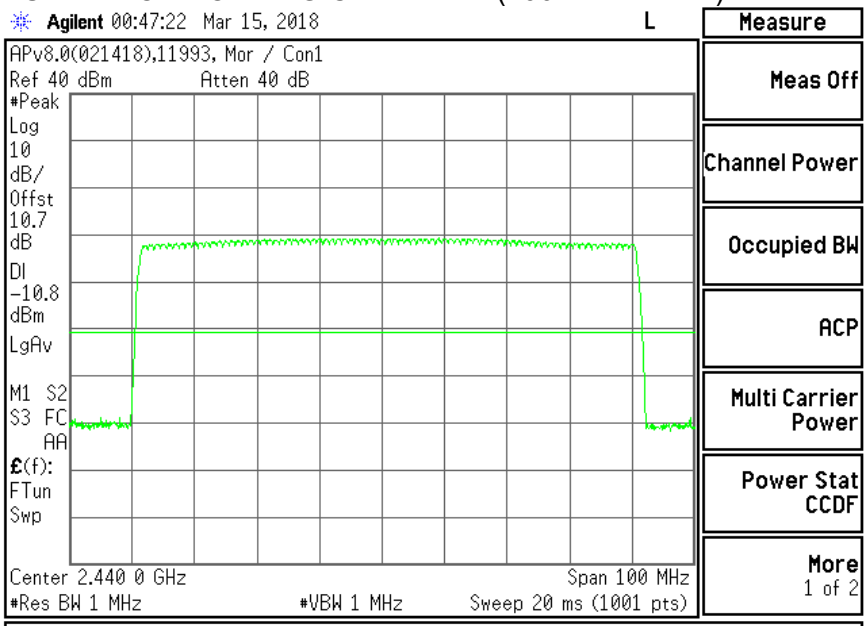
Test Date: 2018-03-15
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

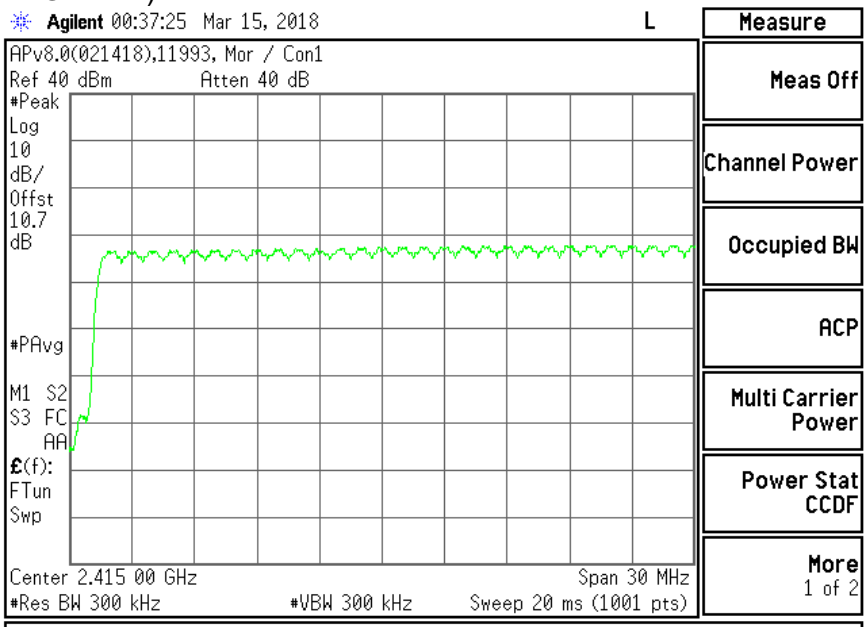
Normal Mode: 79 Channels observed.
AFH Mode: 20 Channels declared.

NUMBER OF HOPPING CHANNELS

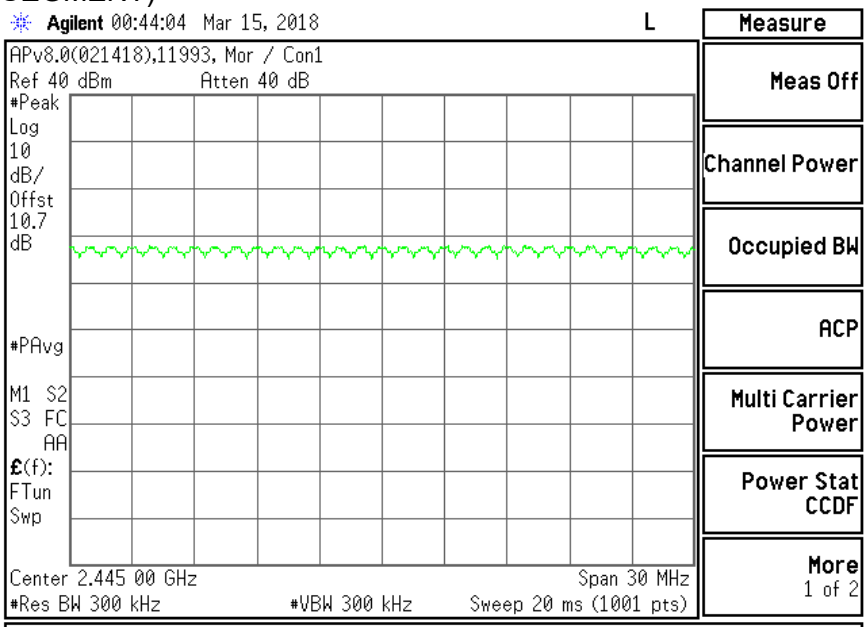
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



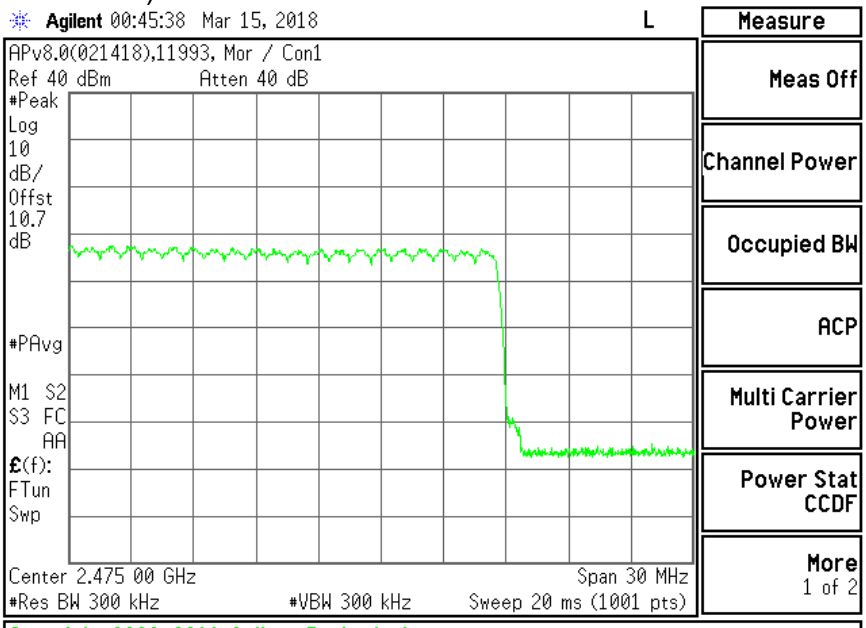
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



8.3.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1 (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.

TEST INFORMATION

Test Date: 2018-03-24 and 2018-04-11
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon and Jeffrey Cabrera

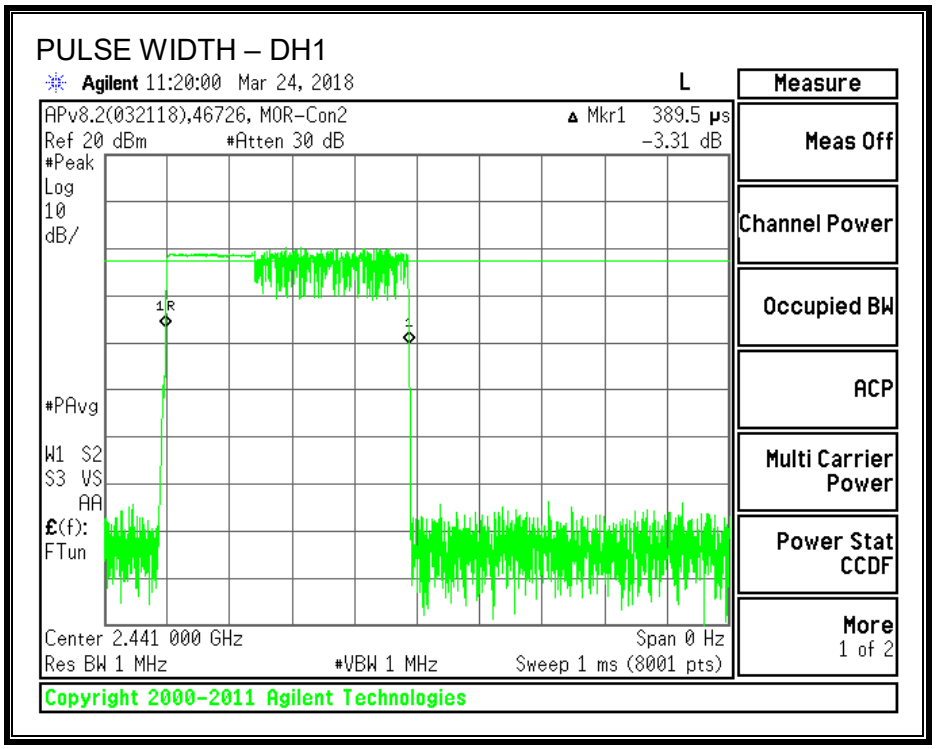
RESULTS

DQPSK Mode

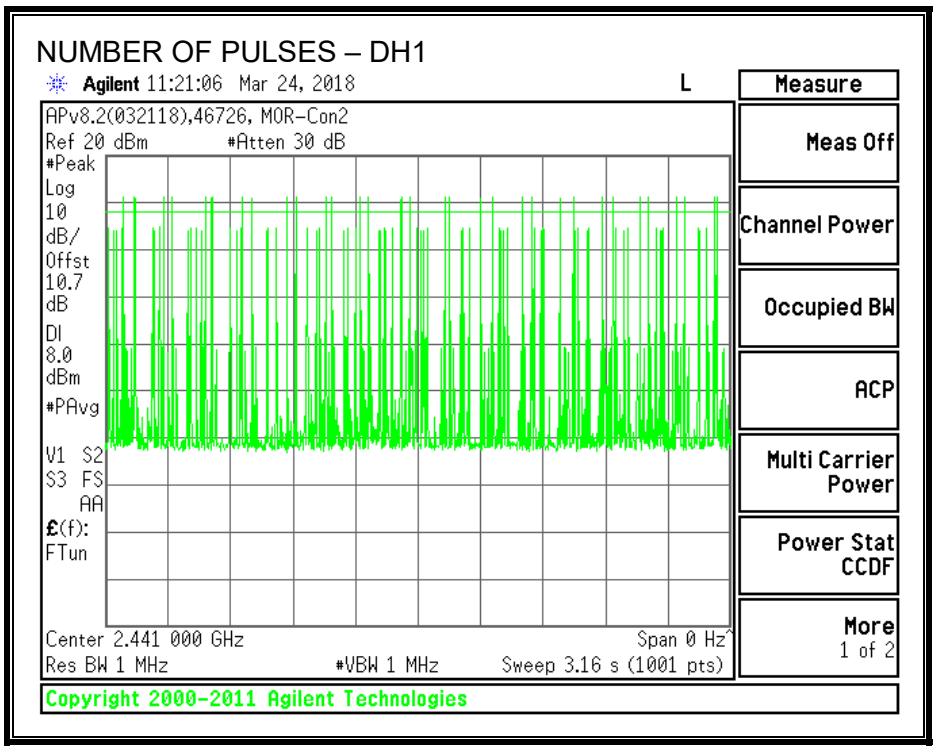
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.3895	32	0.125	0.4	-0.275
DH3	1.64	17	0.279	0.4	-0.121
DH5	2.882	12	0.346	0.4	-0.054

Note: for AFH (DQPSK) mode, please refer to the results of AFH (GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.

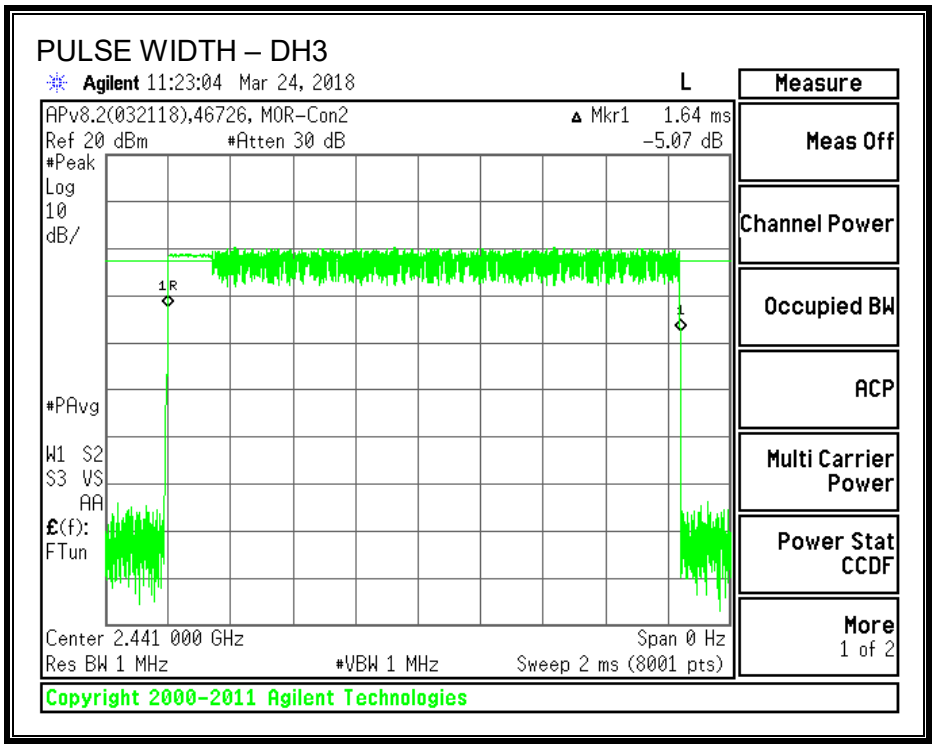
PULSE WIDTH – DH1



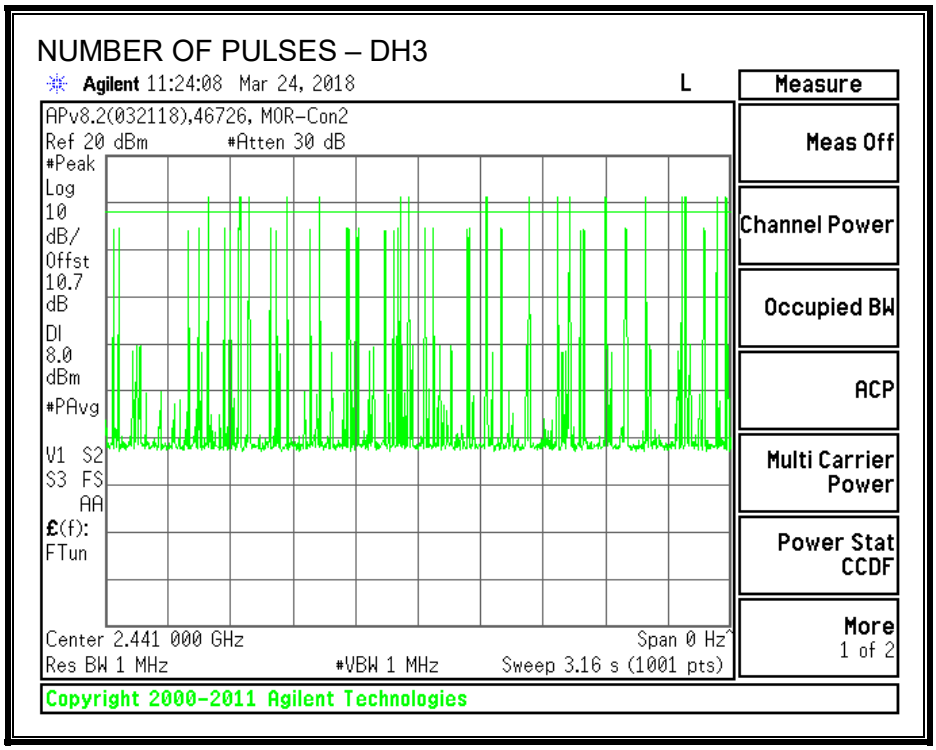
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



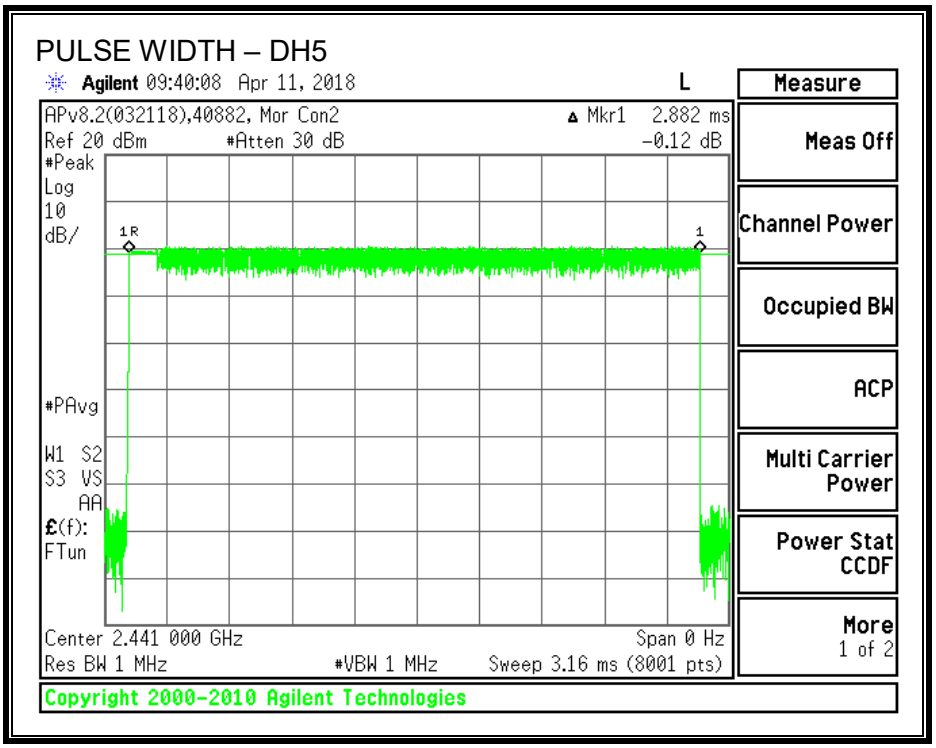
PULSE WIDTH – DH3



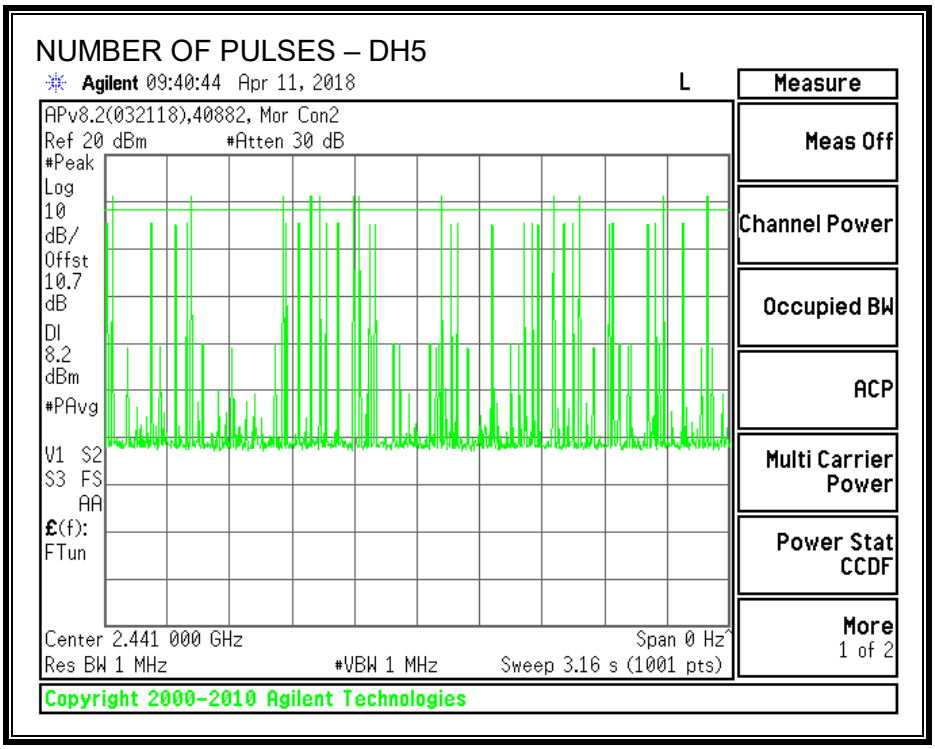
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



8.3.5. OUTPUT POWER – EXTERNAL ANTENNA

LIMIT

§15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 5.4 (b)

For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST INFORMATION

Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	8.85	1.34	21	-12.15
Middle	2441	10.06	1.34	21	-10.94
High	2480	9.06	1.34	21	-11.94

8.3.6. OUTPUT POWER – PCB ANTENNA

LIMIT

§15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 5.4 (b)

For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST INFORMATION

Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

For 75 or more hopping channels

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	8.85	1.61	21	-12.15
Middle	2441	10.06	1.61	21	-10.94
High	2480	9.06	1.61	21	-11.94

8.3.7. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

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

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6.17
Middle	2441	7.41
High	2480	5.07

TEST INFORMATION

Test Date: 2018-03-20
Project No: 12053557
Tested By: Eric McCalister / Niklas Haydon

8.3.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

IC RSS-247 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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.

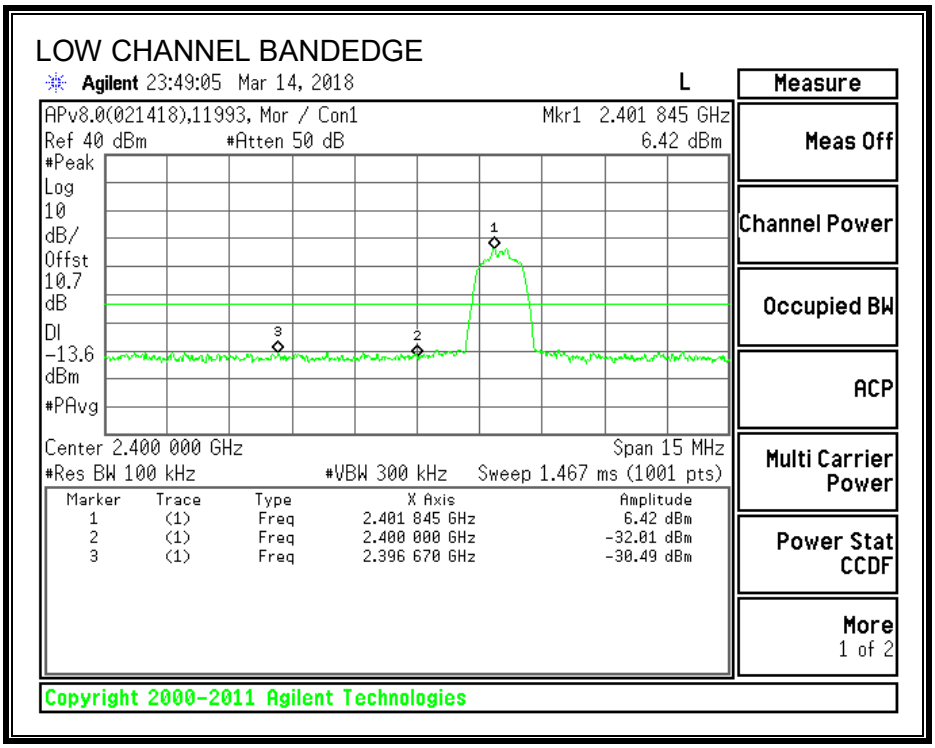
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

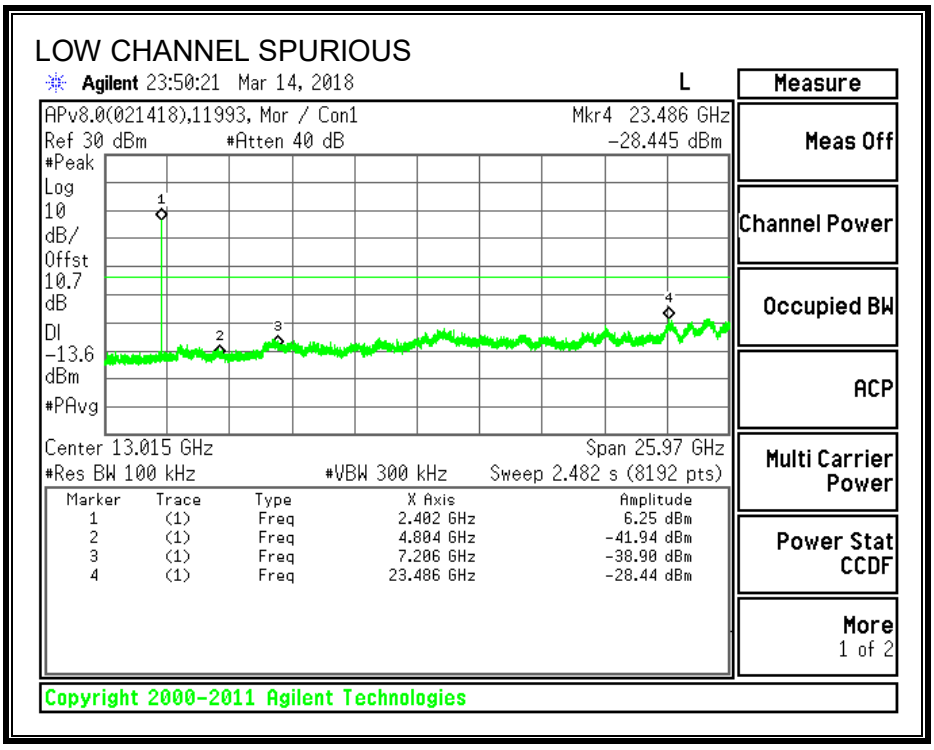
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

TEST INFORMATION

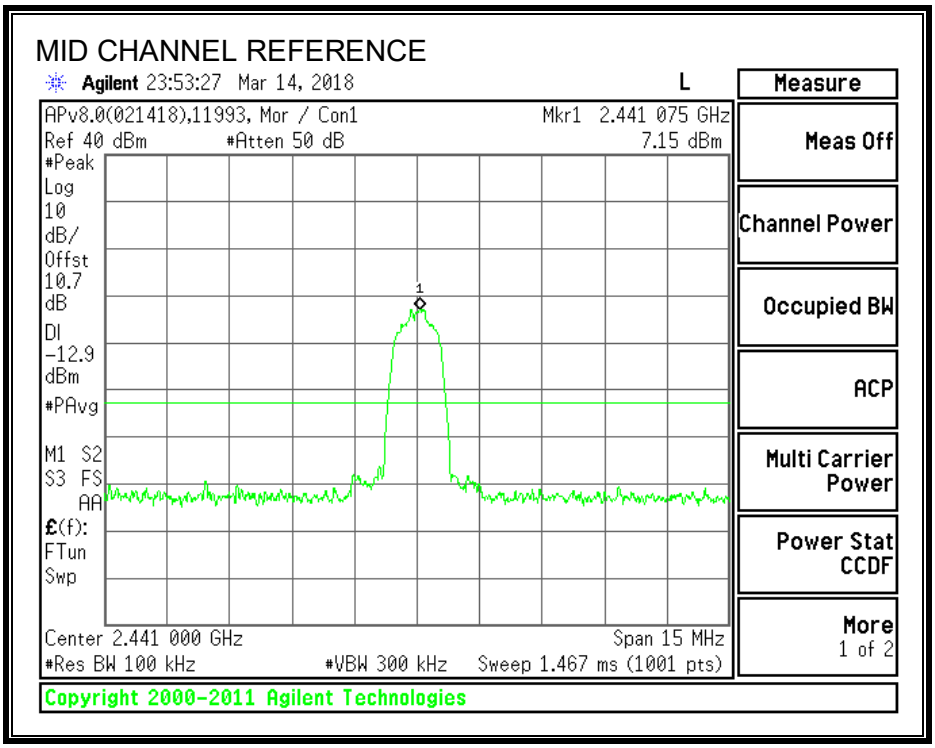
Test Date: 2018-03-14 and 2018-03-15
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

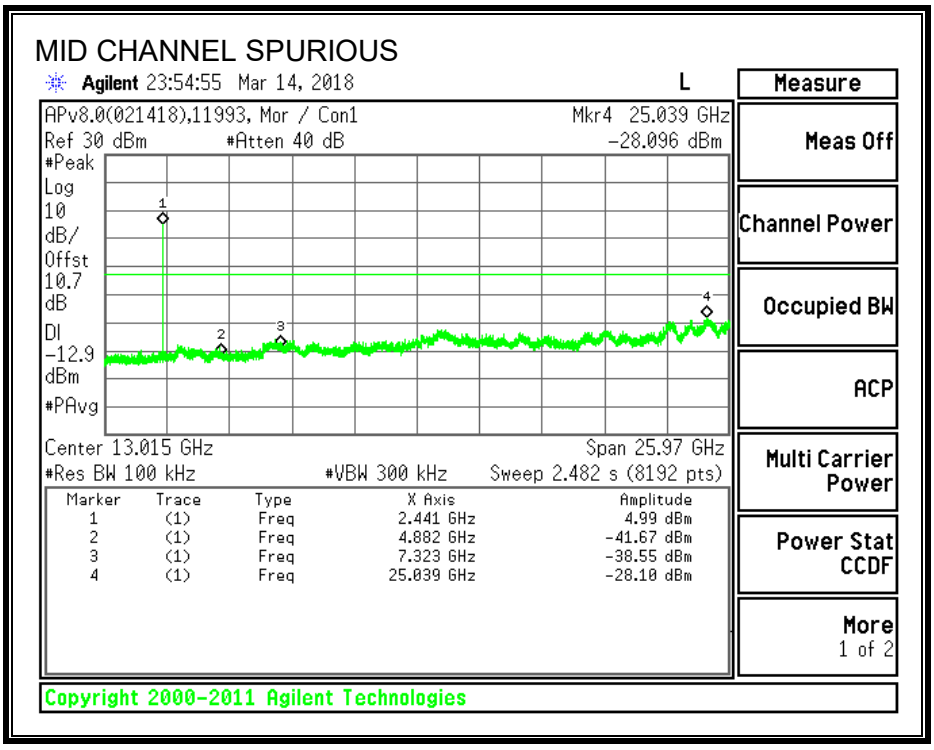
SPURIOUS EMISSIONS, LOW CHANNEL



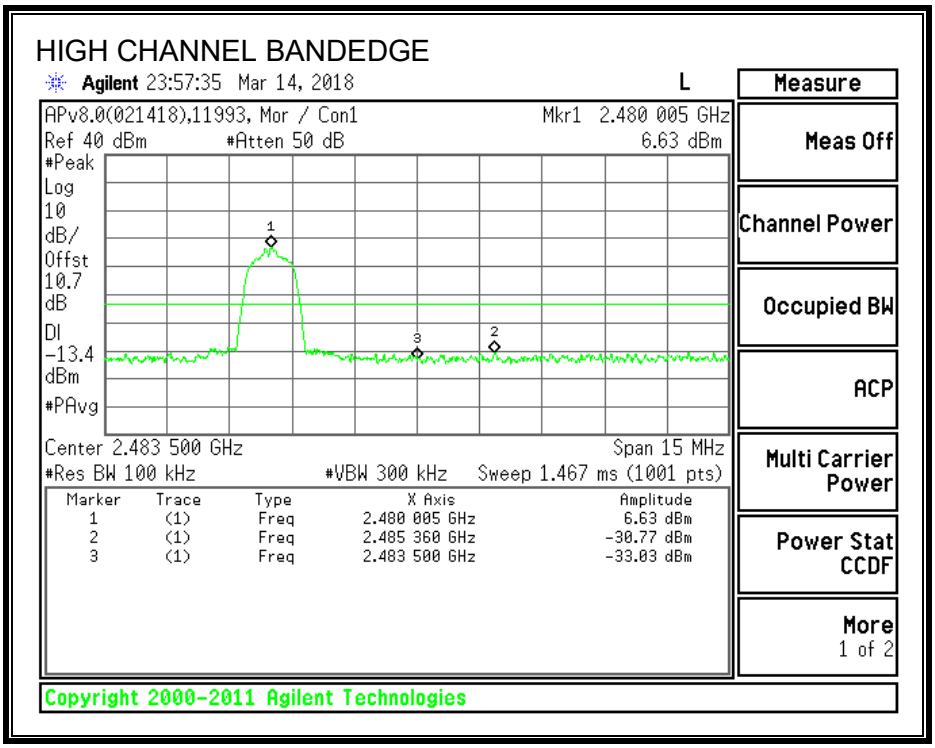


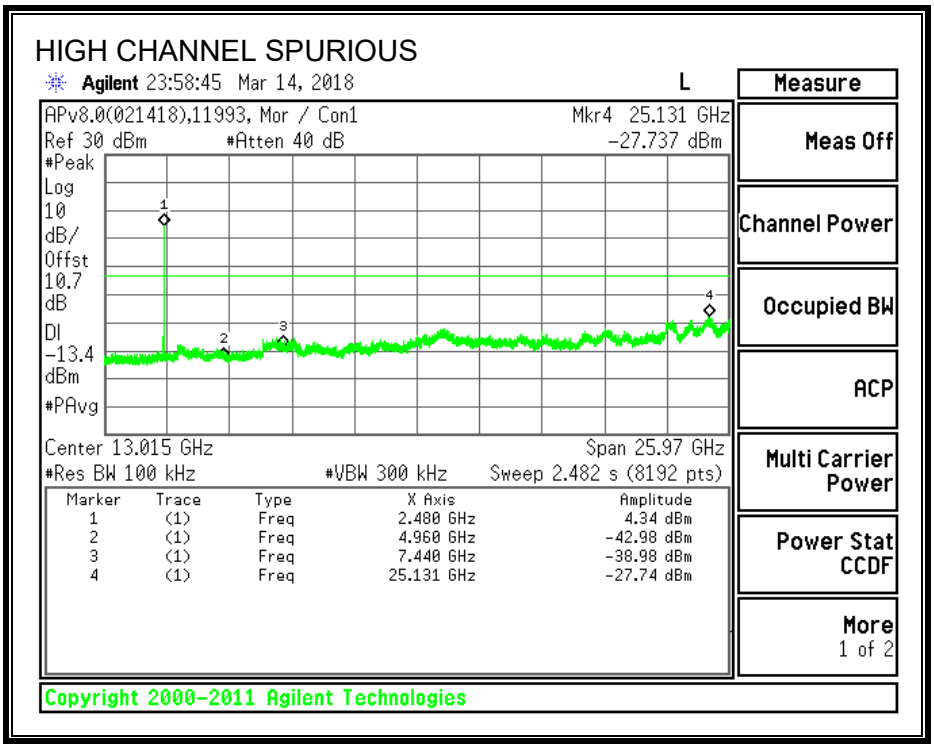
SPURIOUS EMISSIONS, MID CHANNEL





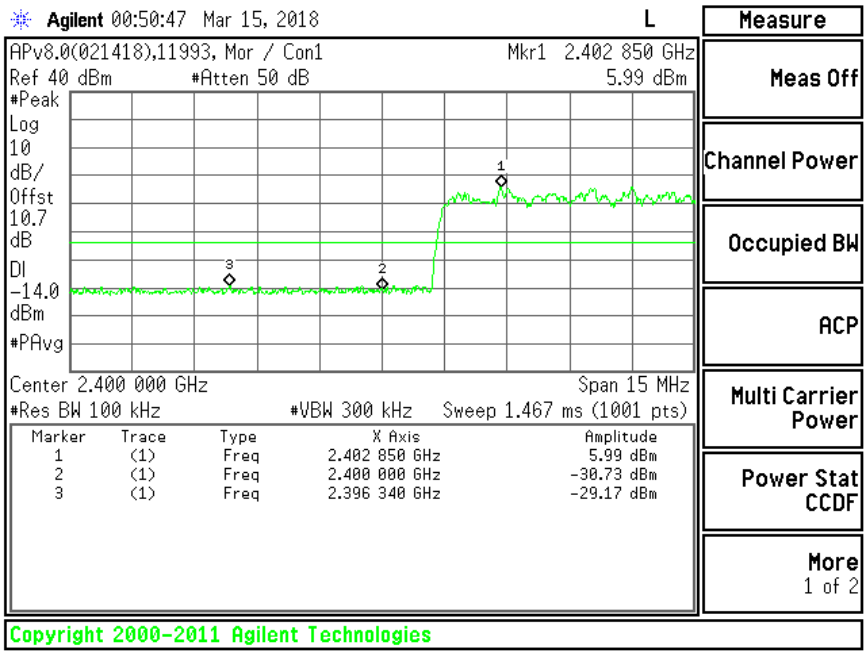
SPURIOUS EMISSIONS, HIGH CHANNEL



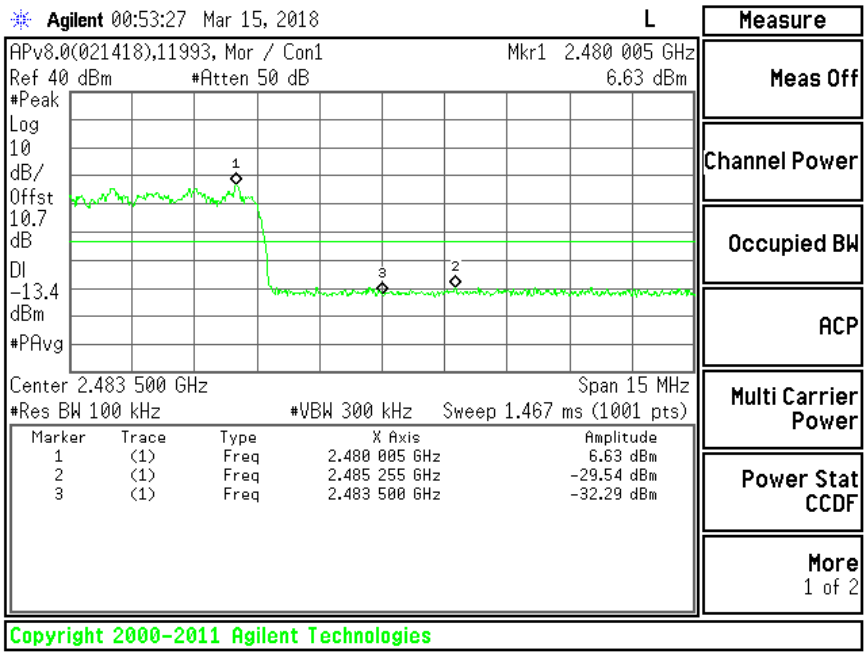


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



8.4. ENHANCED DATA RATE 8PSK MODULATION

8.4.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.
Test per ANSI C63.10 Sections 6.9.2 and 6.9.3 and RSS-Gen 6.6.

TEST PROCEDURE

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

TEST INFORMATION

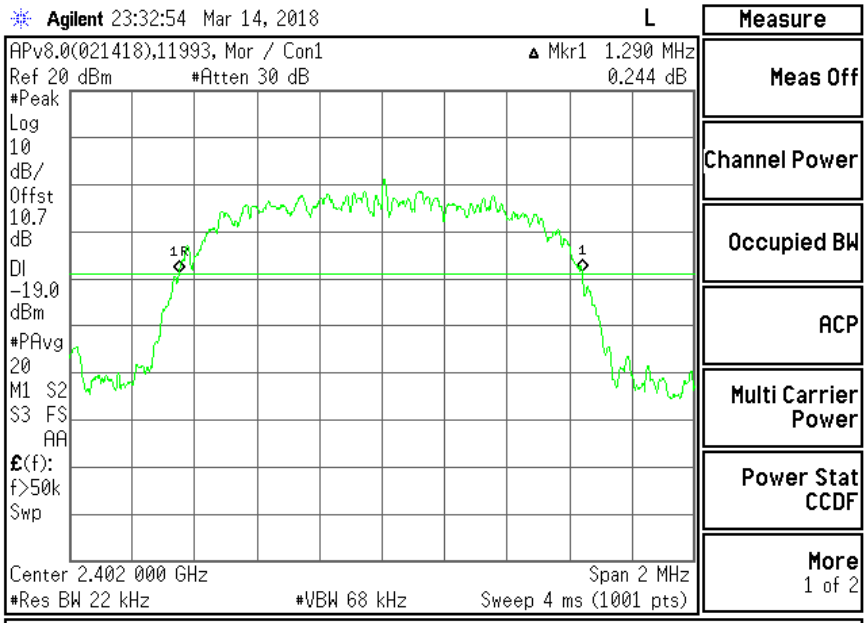
Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

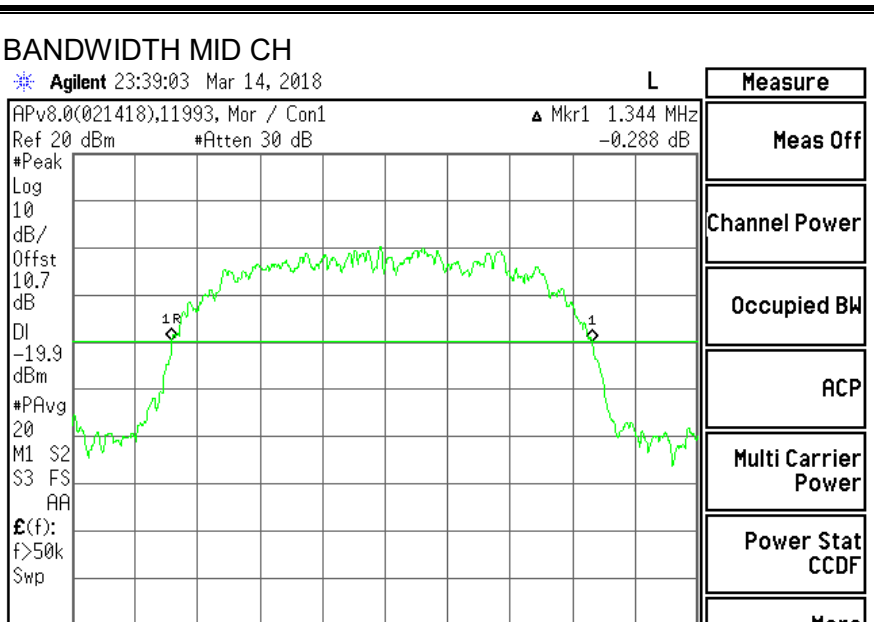
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.290	1.1838
Middle	2441	1.344	1.1865
High	2480	1.286	1.1854

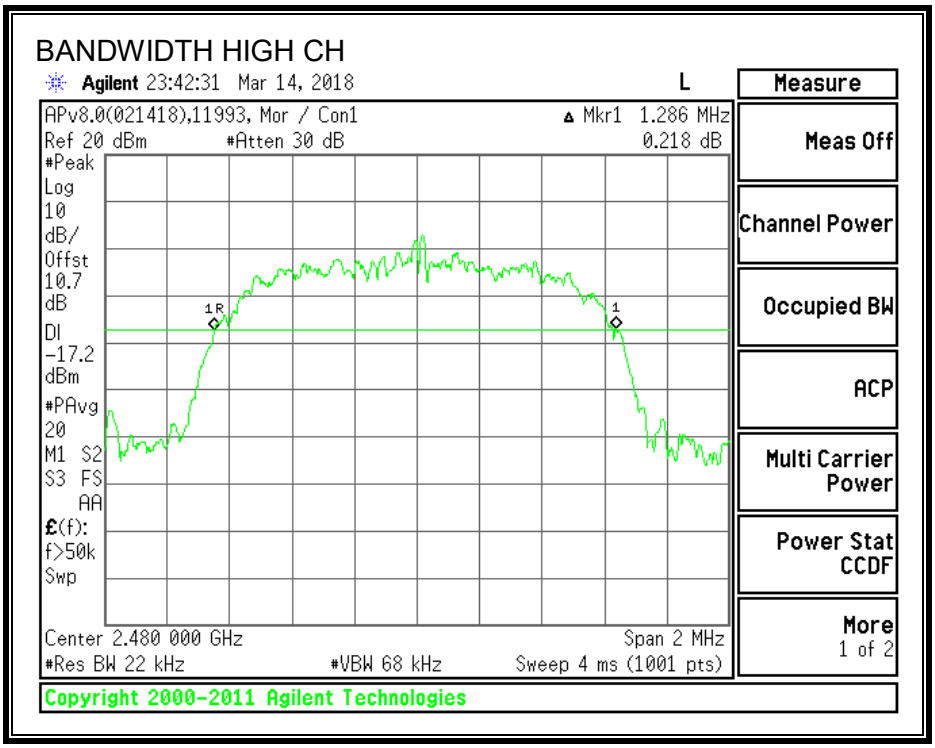
20 dB BANDWIDTH PLOTS

BANDWIDTH LOW CH

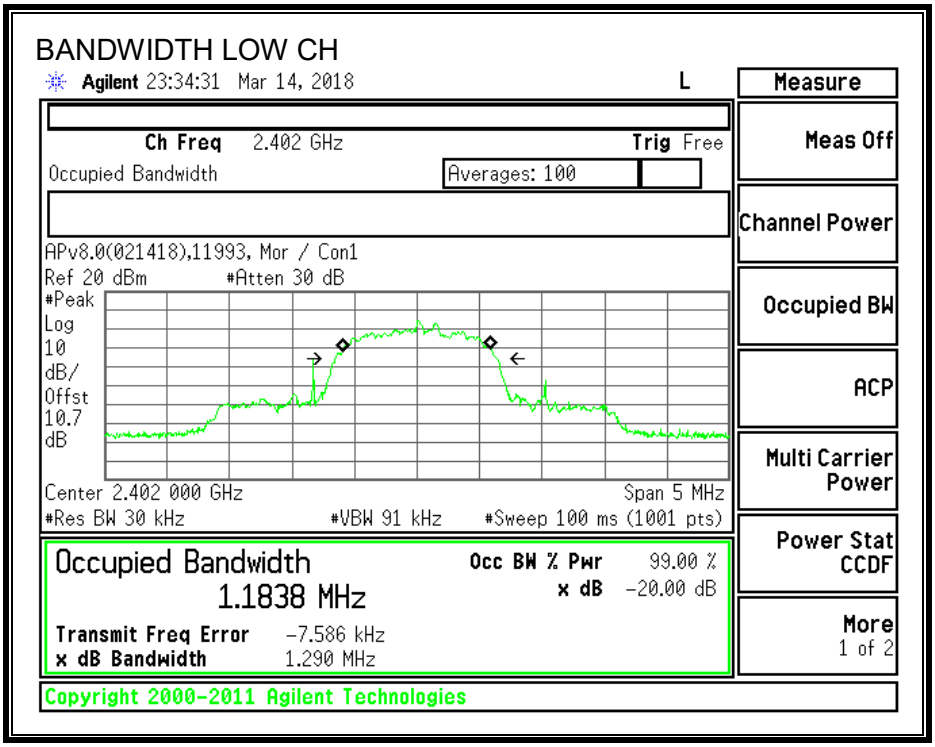


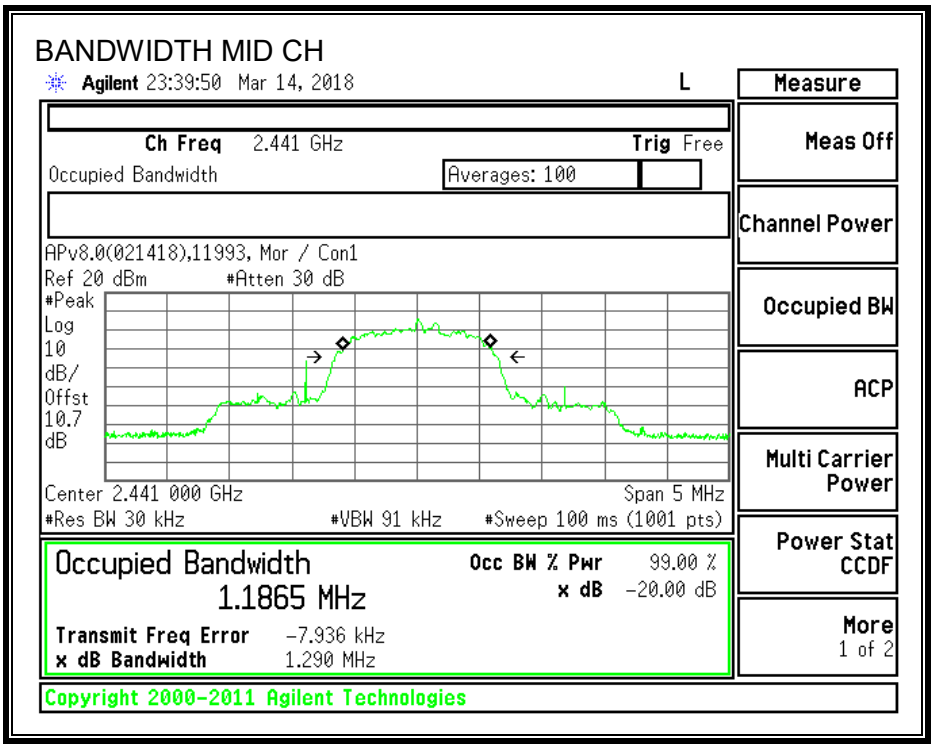
BANDWIDTH MID CH

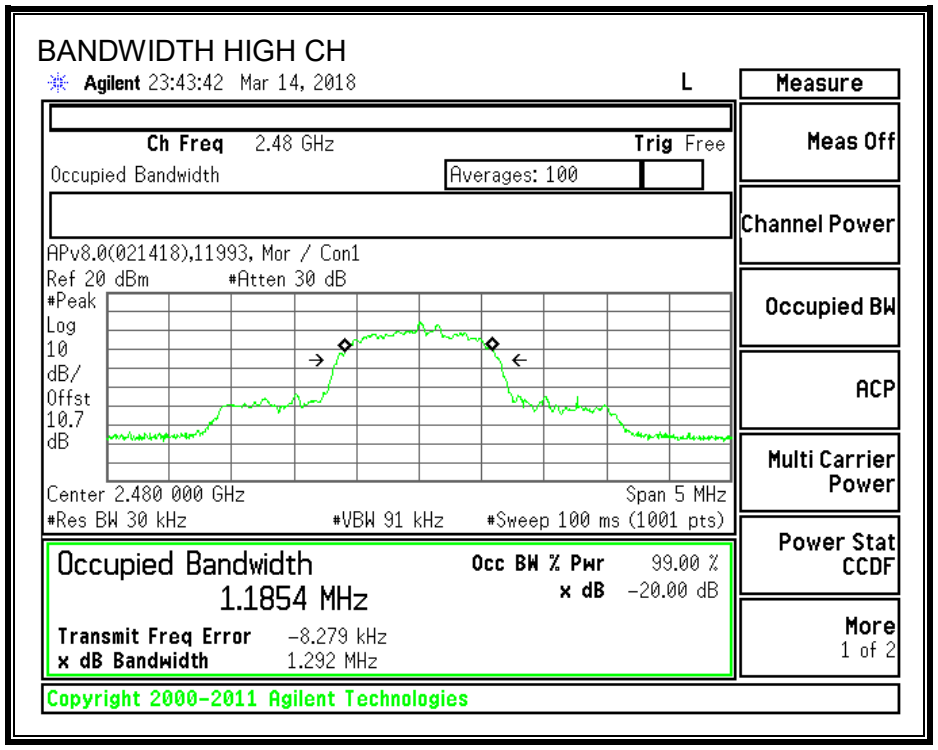




99% BANDWIDTH PLOTS







8.4.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-247 5.1 (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

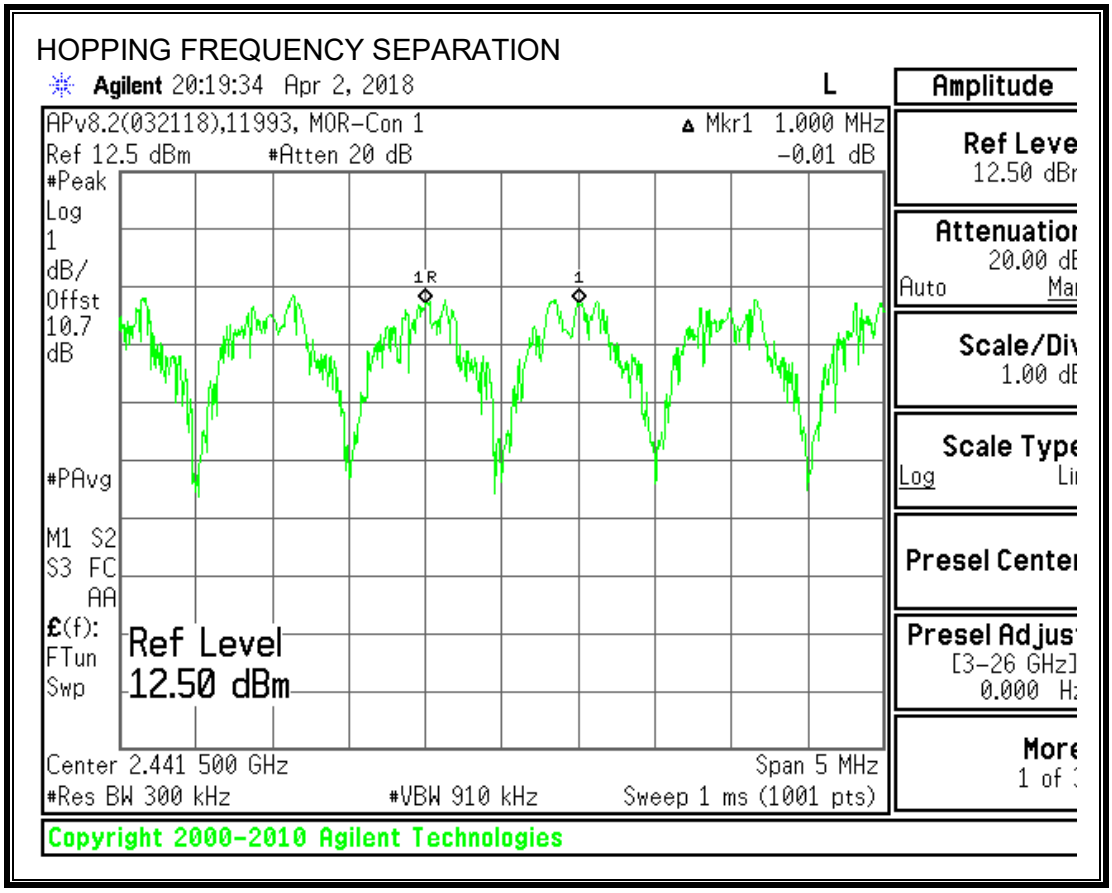
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to ≥ RBW. The sweep time is coupled.

TEST INFORMATION

Test Date: 2018-04-02
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

HOPPING FREQUENCY SEPARATION



Ch. A (MHz)	Ch. B (MHz)	Ch. 1 to Ch. 2 Sep. (MHz)	Max. 20 dB BW (MHz)	2/3 20 dB BW (MHz)	Margin (MHz)
2441	2442	1.000	1.344	0.896	-0.104

Note – The channel hopping separation of 1MHz is less than the 20 dB bandwidth (approx. 1.34 MHz). However, the output power is less than 125 mW and the channel separation is greater than 2/3 the 20 dB bandwidth (approx. 896 kHz).

8.4.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1 (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 for visibility of the entire span. Then, smaller spans are set to more clearly identify the channels. The RBW is set to 30% of the channel spacing (approx. 300kHz). The analyzer is set to Max Hold.

TEST INFORMATION

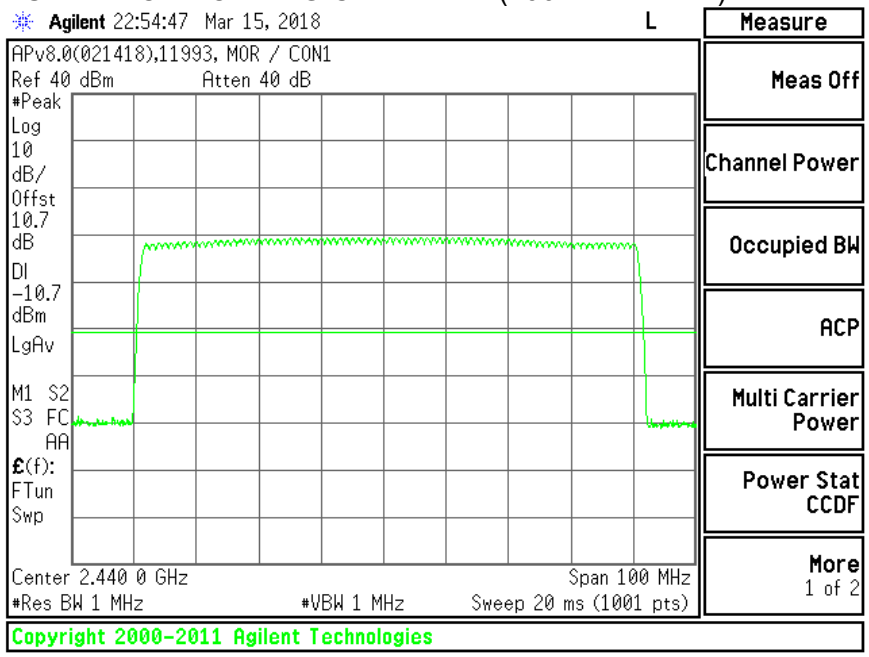
Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

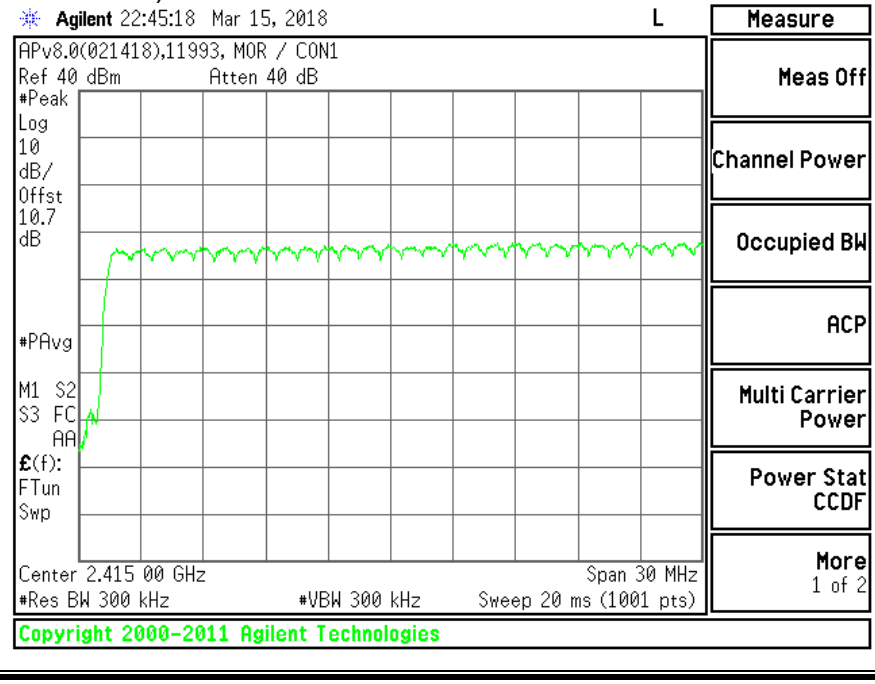
Normal Mode: 79 Channels observed.
AFH Mode: 20 Channels declared.

NUMBER OF HOPPING CHANNELS

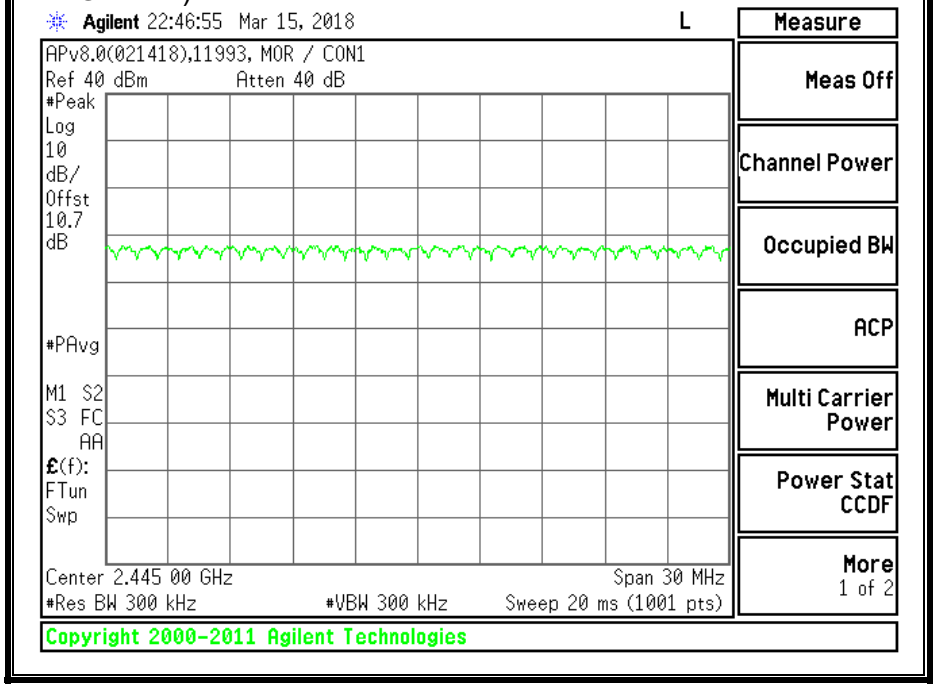
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



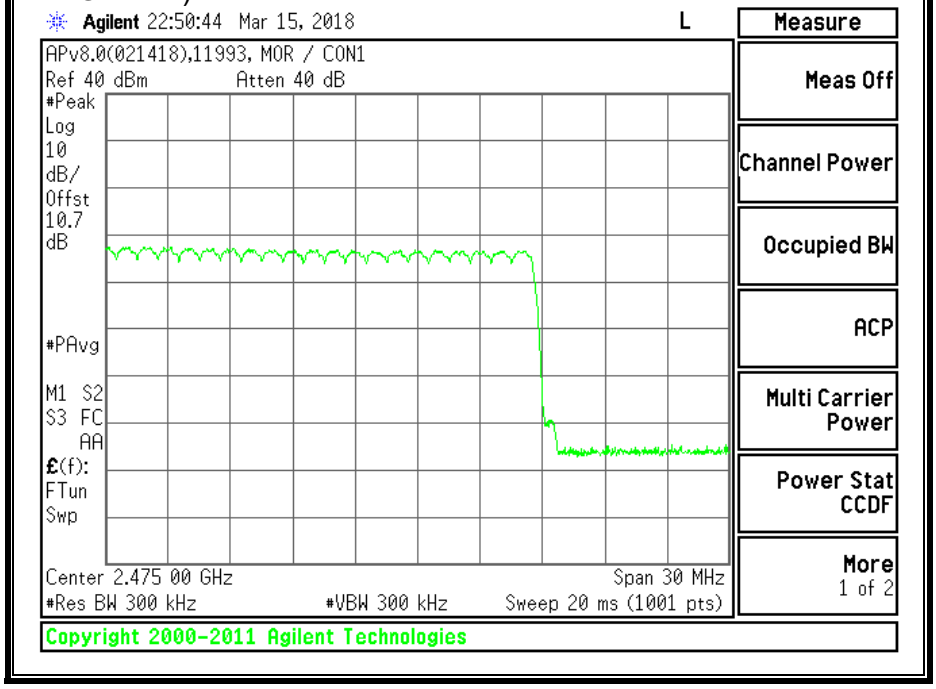
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



8.4.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1 (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.

TEST INFORMATION

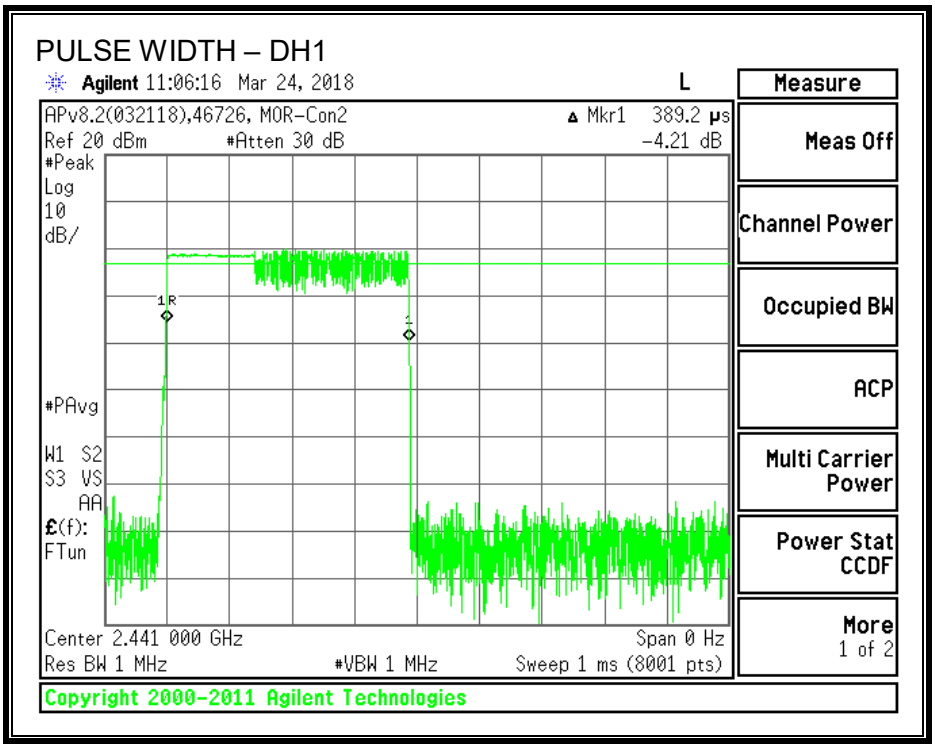
Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

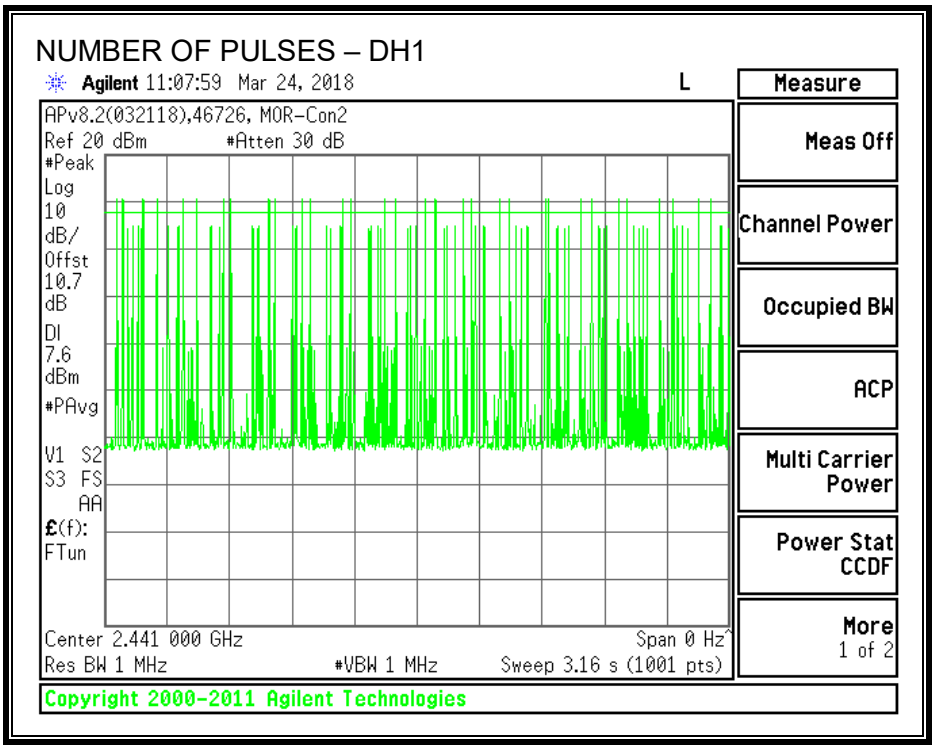
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.3892	32	0.125	0.4	-0.275
DH3	1.641	15	0.246	0.4	-0.154
DH5	2.891	10	0.289	0.4	-0.111

Note: for AFH (8PSK) mode, please refer to the results of AFH (GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.

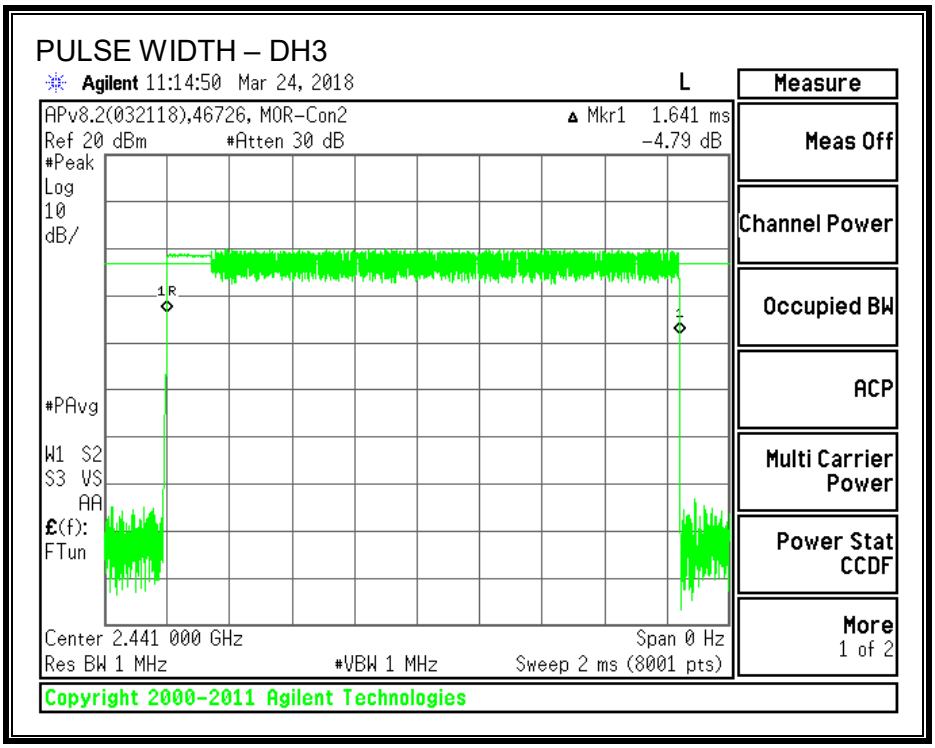
PULSE WIDTH - DH1



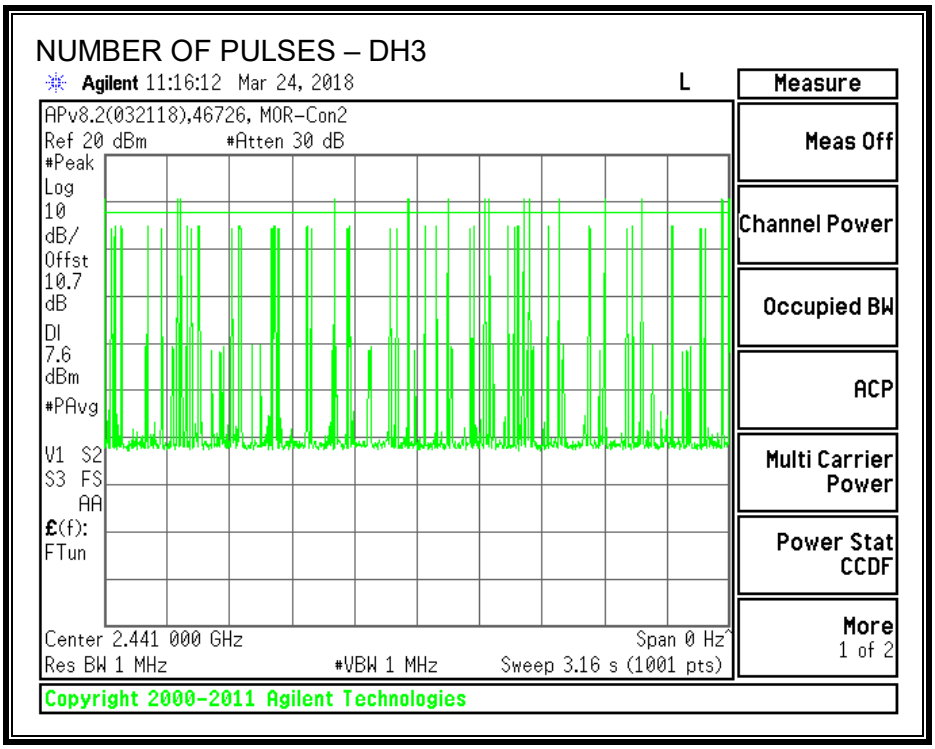
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



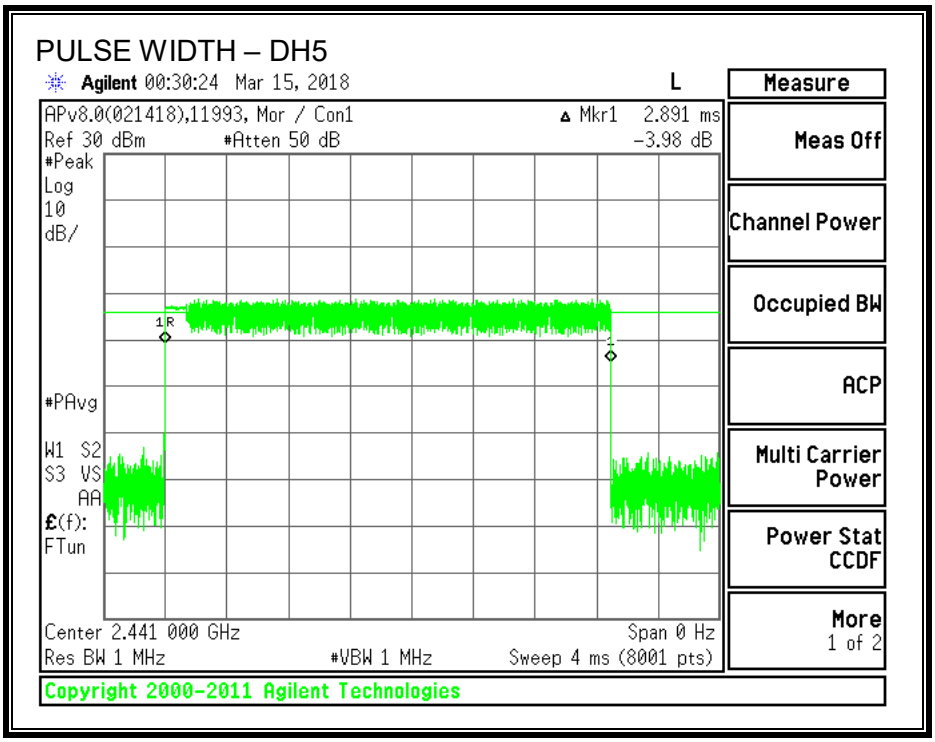
PULSE WIDTH – DH3



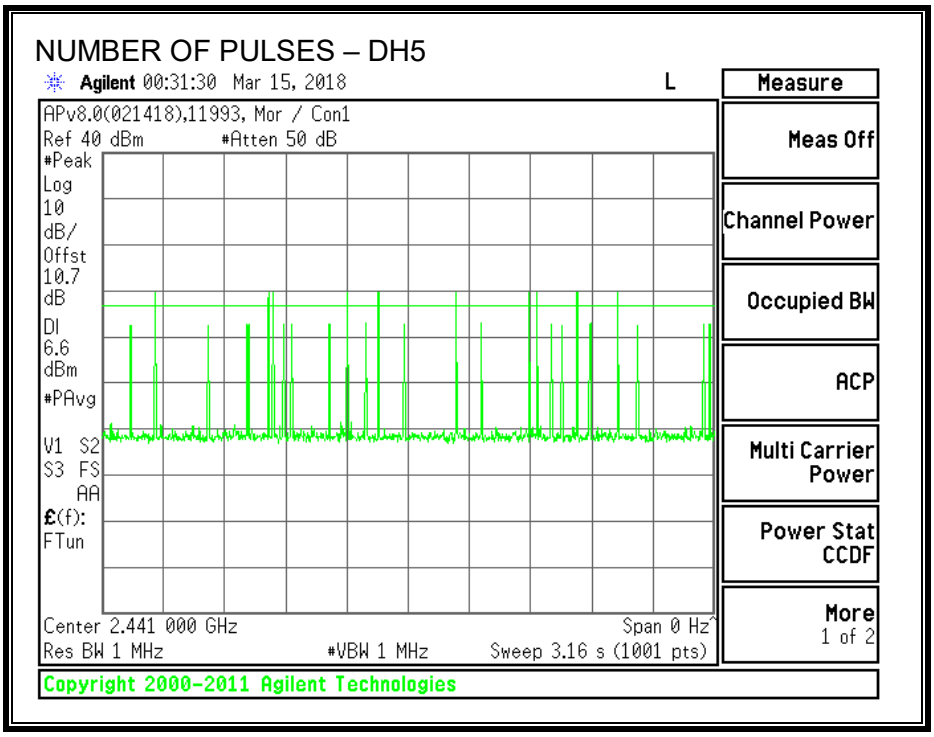
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



8.4.5. OUTPUT POWER – EXTERNAL ANTENNA

LIMIT

§15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 5.4 (b)

For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST INFORMATION

Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	9.29	1.34	21	-11.71
Middle	2441	10.49	1.34	21	-10.51
High	2480	9.51	1.34	21	-11.49

8.4.6. OUTPUT POWER – PCB ANTENNA

LIMIT

§15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 5.4 (b)

For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST INFORMATION

Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	9.29	1.61	21	-11.71
Middle	2441	10.49	1.61	21	-10.51
High	2480	9.51	1.61	21	-11.49

8.4.7. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.40
Middle	2441	7.42
High	2480	6.42

TEST INFORMATION

Test Date 2018-03-15
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

8.4.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

IC RSS-247 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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.

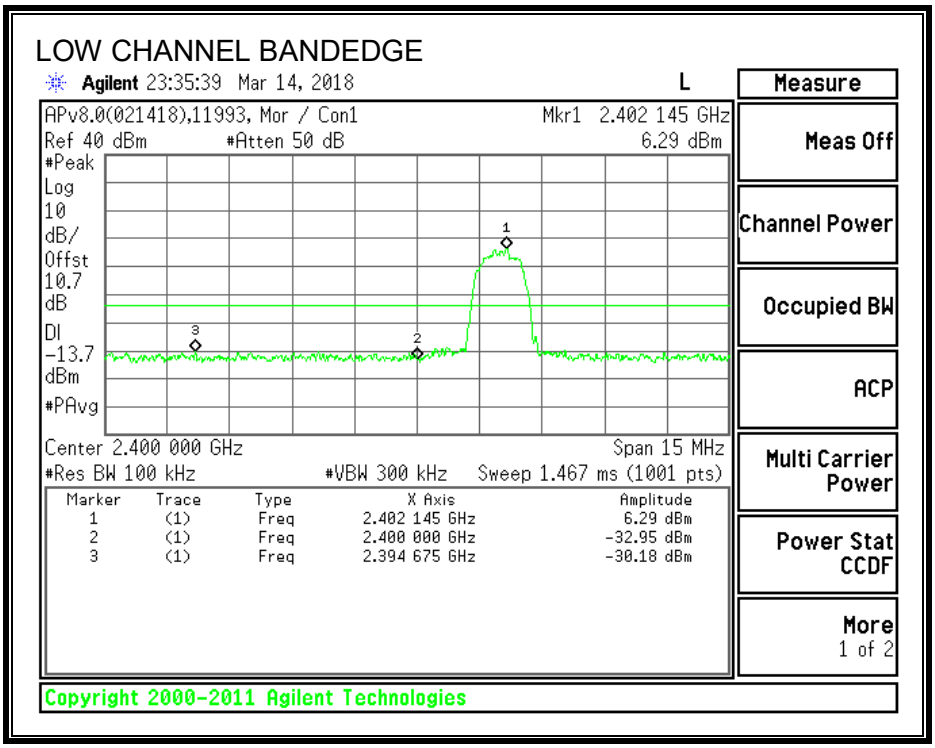
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

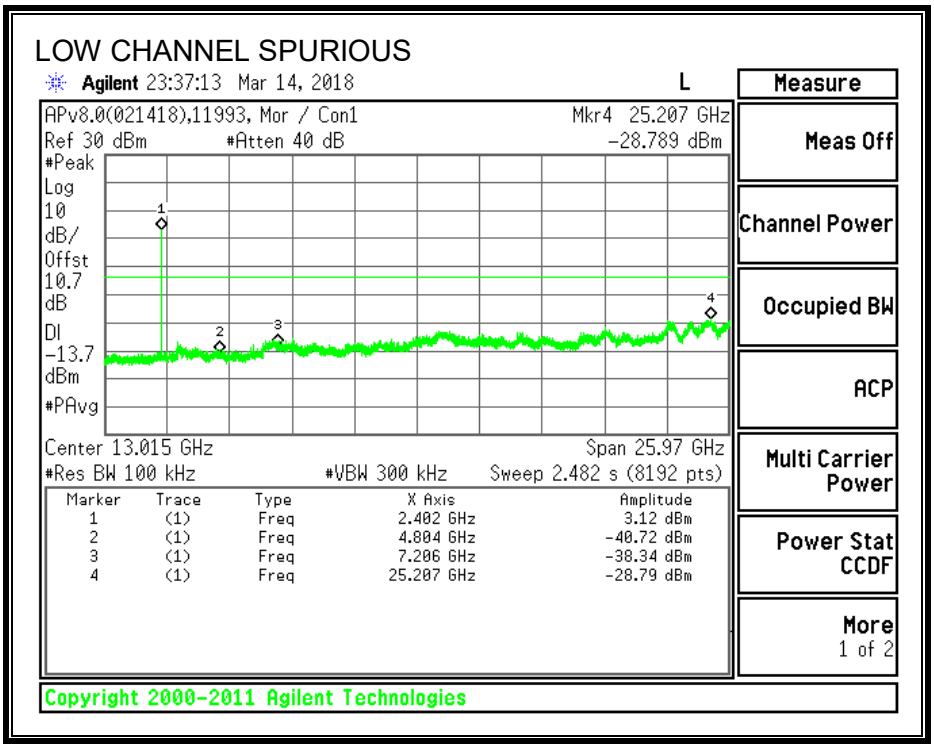
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

TEST INFORMATION

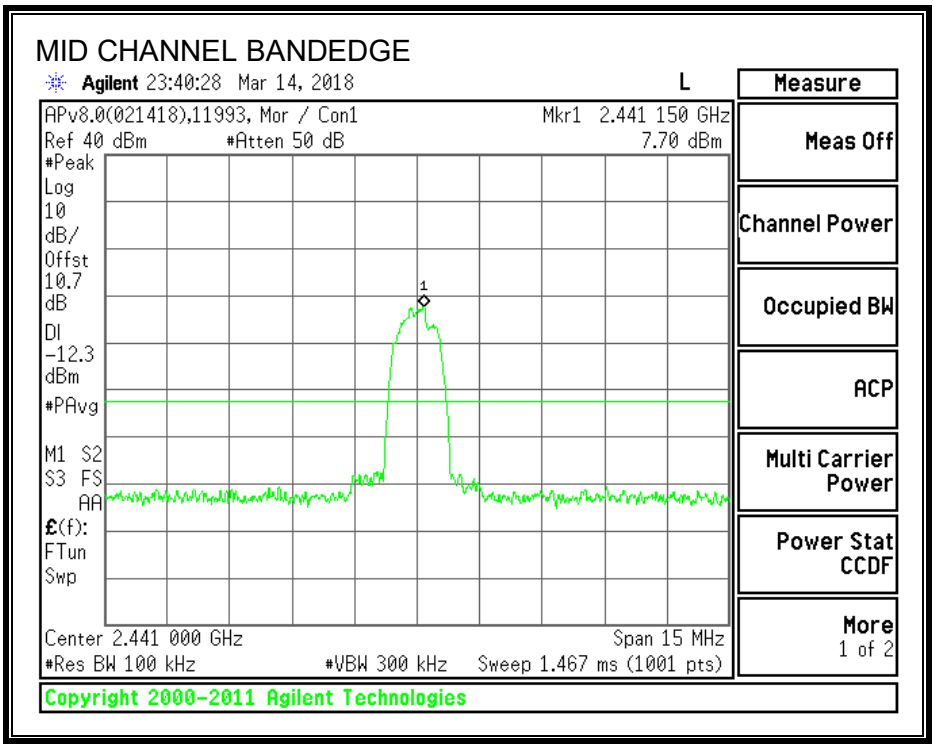
Test Date: 2018-03-14
Project: 12053557
Tested By: Eric McCalister / Niklas Haydon

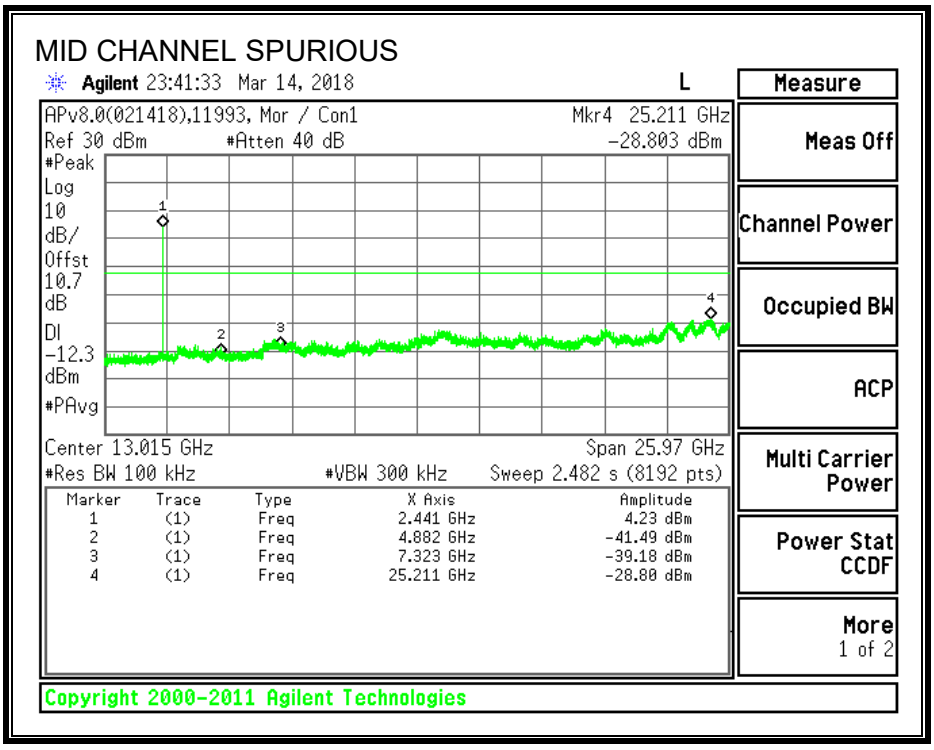
SPURIOUS EMISSIONS, LOW CHANNEL



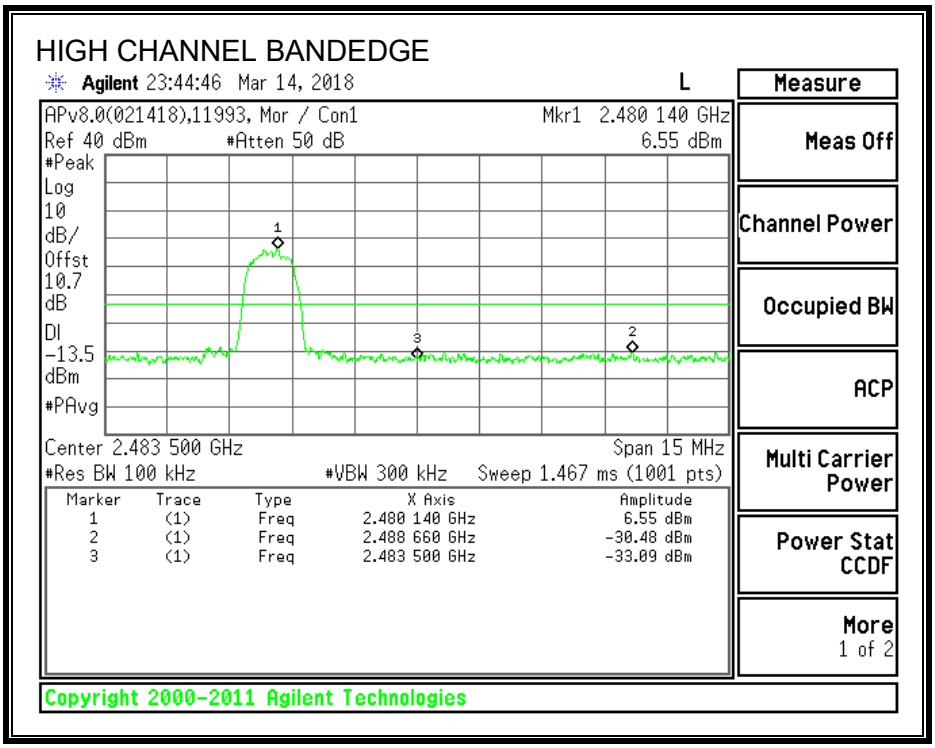


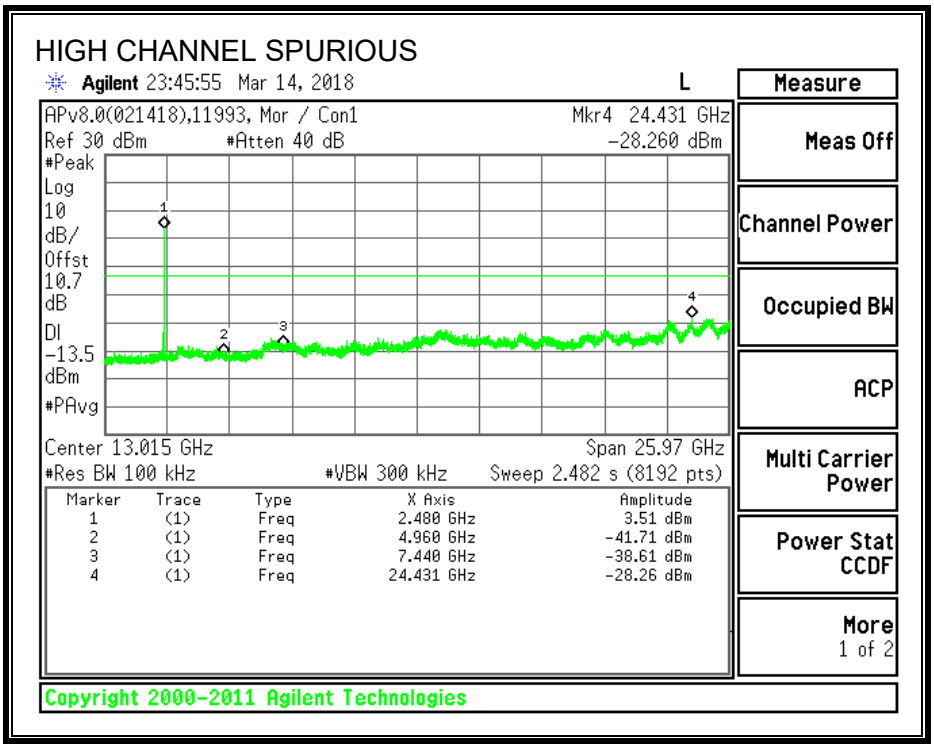
SPURIOUS EMISSIONS, MID CHANNEL





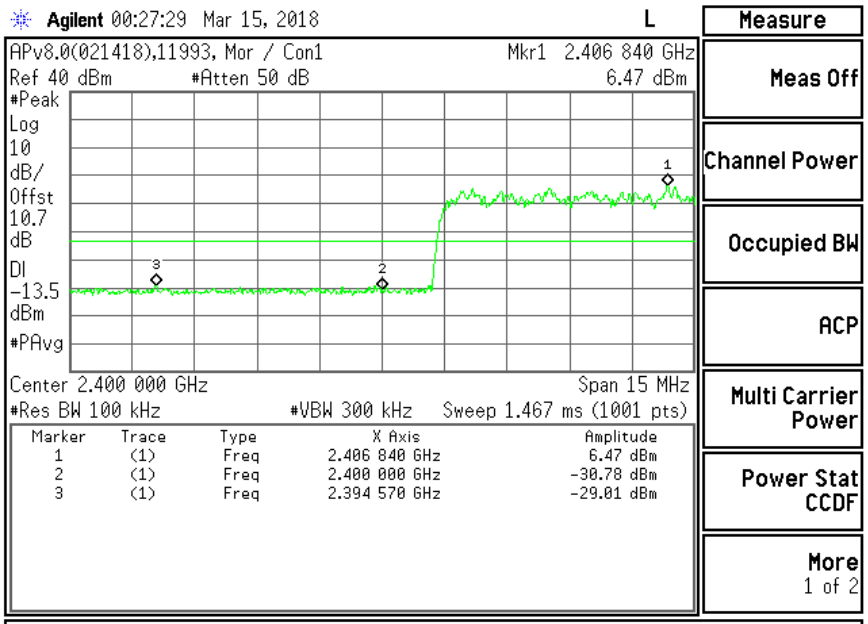
SPURIOUS EMISSIONS, HIGH CHANNEL



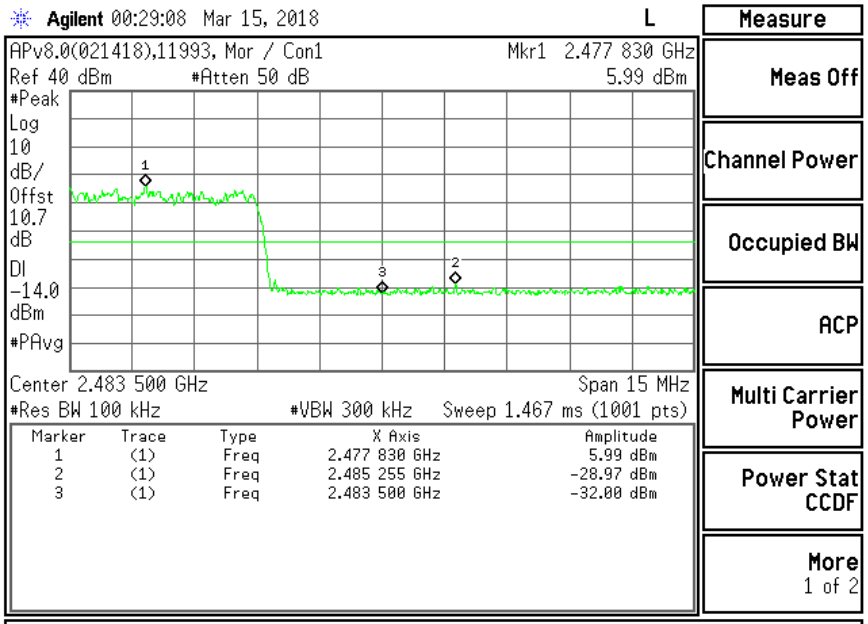


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN Clause 8.9 (Transmitter)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
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 for below 1GHz measurements and 1.5 m above the ground plane for above 1GHz measurements. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements for the 30-1000 MHz range, 9 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements for the 0.15-30 MHz range and 200 Hz for peak detection measurements or 200 Hz for quasi-peak detection measurements for the 9 to 150 kHz range. Peak detection is used unless otherwise noted as quasi-peak.

For peak measurements above 1 GHz, the resolution bandwidth is set to 1 MHz and the video bandwidth is set to 3 MHz. For average measurements above 1GHz, the resolution bandwidth and video bandwidth are set as described in ANSI C63.10:2013 for the applicable measurement. The particular averaging method used for this test program was by measuring using a Peak detector with the resolution bandwidth set to 1MHz and a reduced video bandwidth, based on $1/T_{on}$ where T_{on} is the transmit on time.

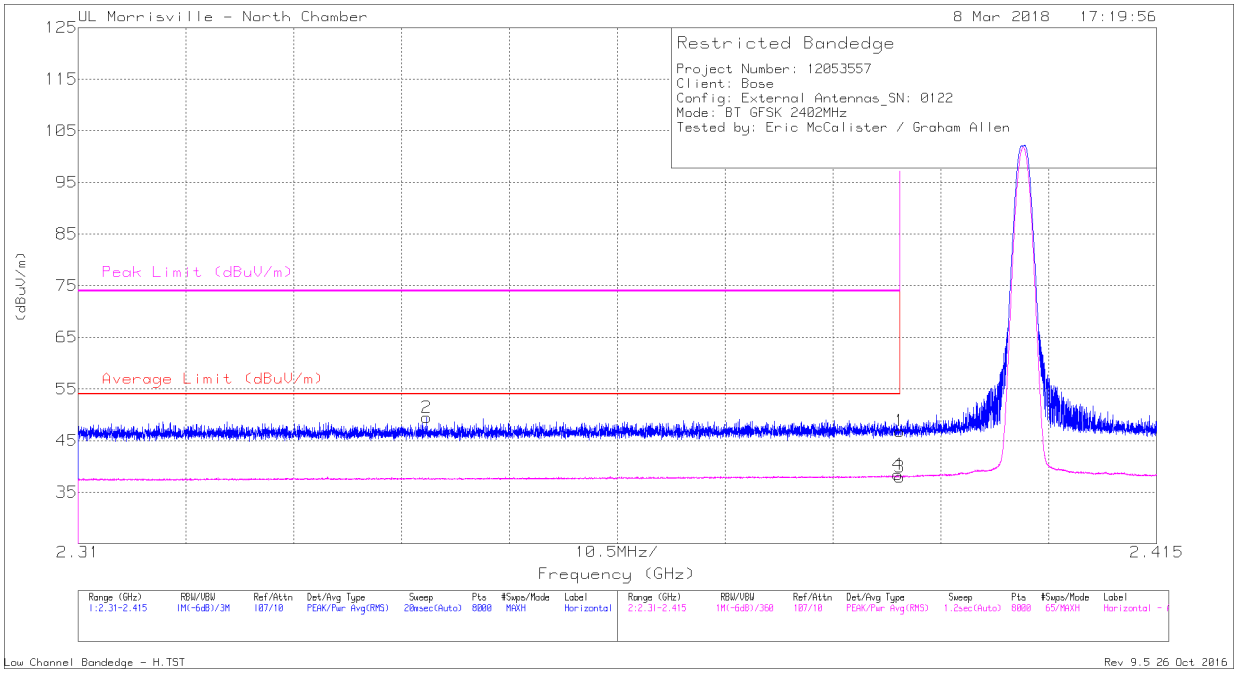
The spectrum from 1 to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. For 9kHz to 1000 MHz and 18 to 26 GHz investigation, the worst-case channel was selected.

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.

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BASIC DATA RATE GFSK MODULATION EXTERNAL ANTENNA

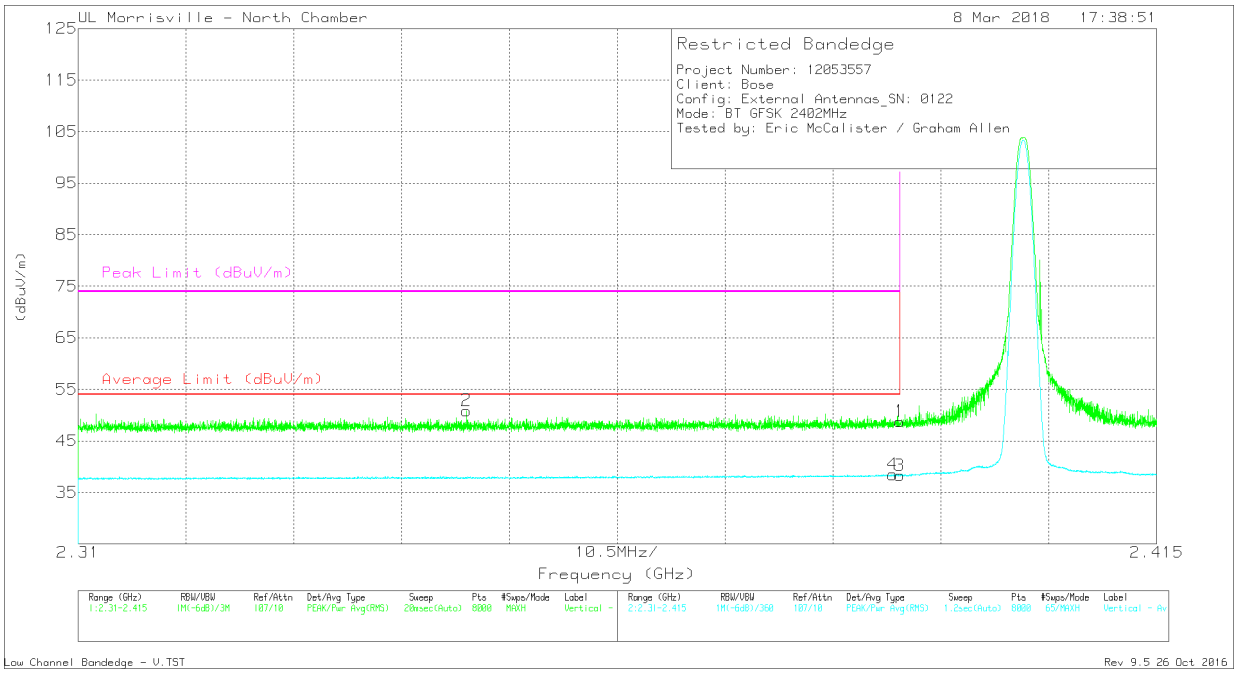
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	38.94	Pk	31.8	-23.9	46.84	-	-	74	-27.16	119	319	H
2	* ** 2.344	41.9	Pk	31.6	-24	49.5	-	-	74	-24.5	119	319	H
3	* ** 2.39	30.05	V1TR	31.8	-23.9	37.95	54	-16.05	-	-	119	319	H
4	* ** 2.39	30.5	V1TR	31.8	-23.9	38.4	54	-15.6	-	-	119	319	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

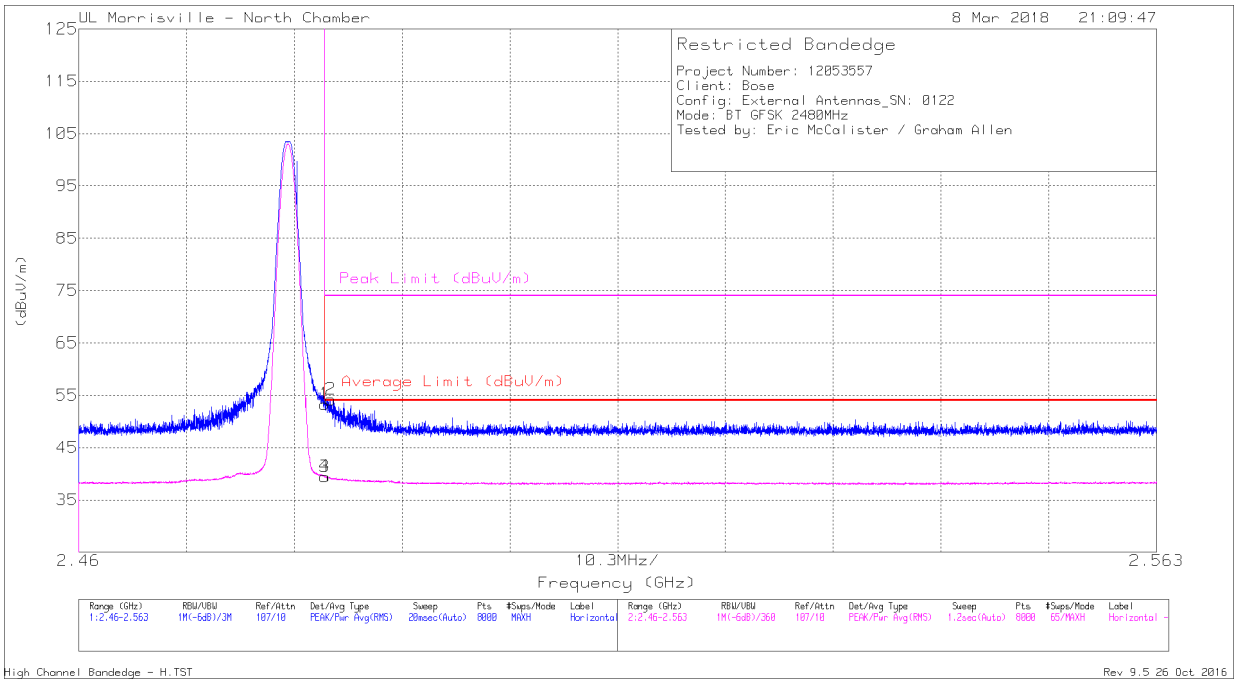
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	40.89	Pk	31.8	-23.9	48.79	-	-	74	-25.21	103	380	V
2	* ** 2.348	43.29	Pk	31.6	-24	50.89	-	-	74	-23.11	103	380	V
3	* ** 2.39	30.4	V1TR	31.8	-23.9	38.3	54	-15.7	-	-	103	380	V
4	* ** 2.389	30.59	V1TR	31.8	-23.9	38.49	54	-15.51	-	-	103	380	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

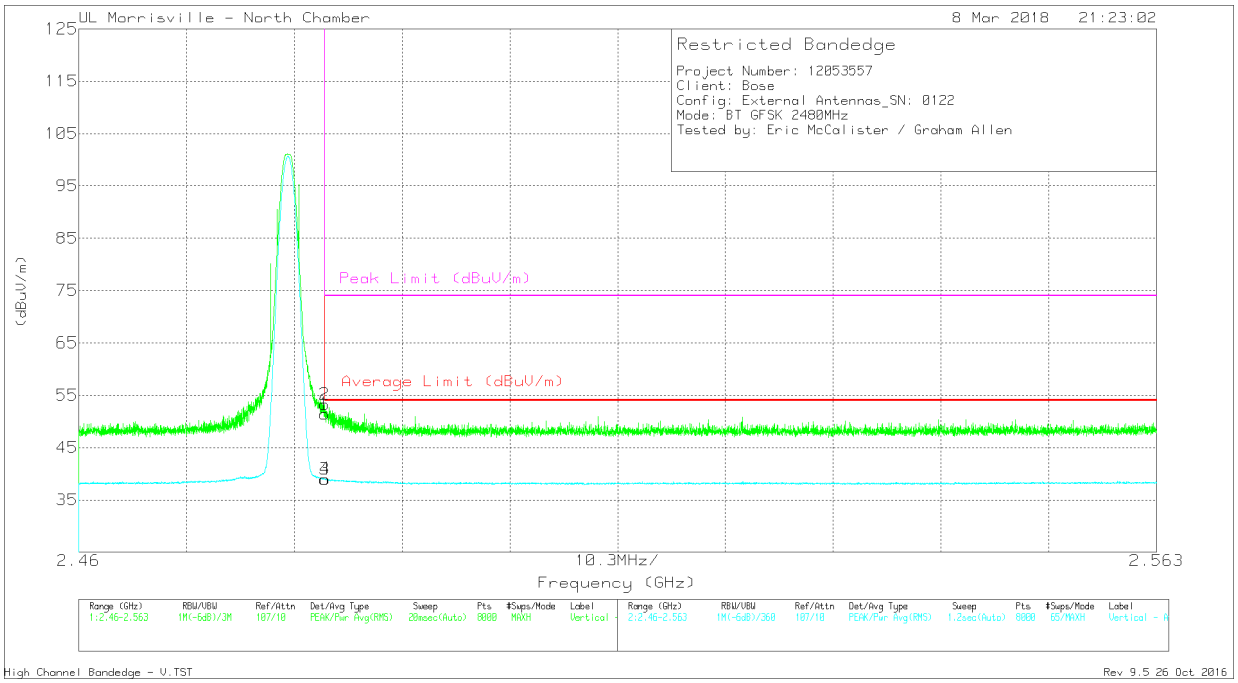
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	* ** 2.484	44.72	Pk	32.3	-23.7	53.32	-	-	74	-20.68	186	123	H
2	* ** 2.484	45.59	Pk	32.3	-23.7	54.19	-	-	74	-19.81	186	123	H
3	* ** 2.484	30.86	V1TR	32.3	-23.7	39.46	54	-14.54	-	-	186	123	H
4	* ** 2.484	30.91	V1TR	32.3	-23.7	39.51	54	-14.49	-	-	186	123	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

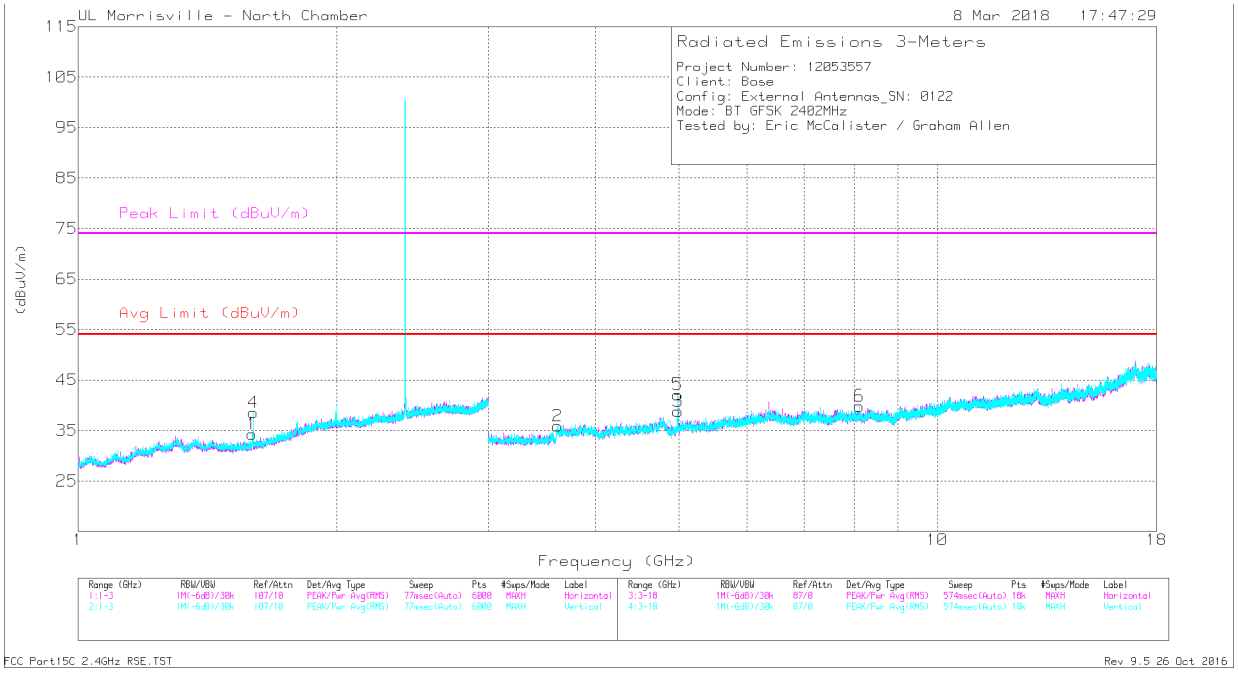


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.484	42.84	Pk	32.3	-23.7	51.44	-	-	74	-22.56	117	109	V
2	* ** 2.484	44.64	Pk	32.3	-23.7	53.24	-	-	74	-20.76	117	109	V
3	* ** 2.484	30.34	V1TR	32.3	-23.7	38.94	54	-15.06	-	-	117	109	V
4	* ** 2.484	30.39	V1TR	32.3	-23.7	38.99	54	-15.01	-	-	117	109	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

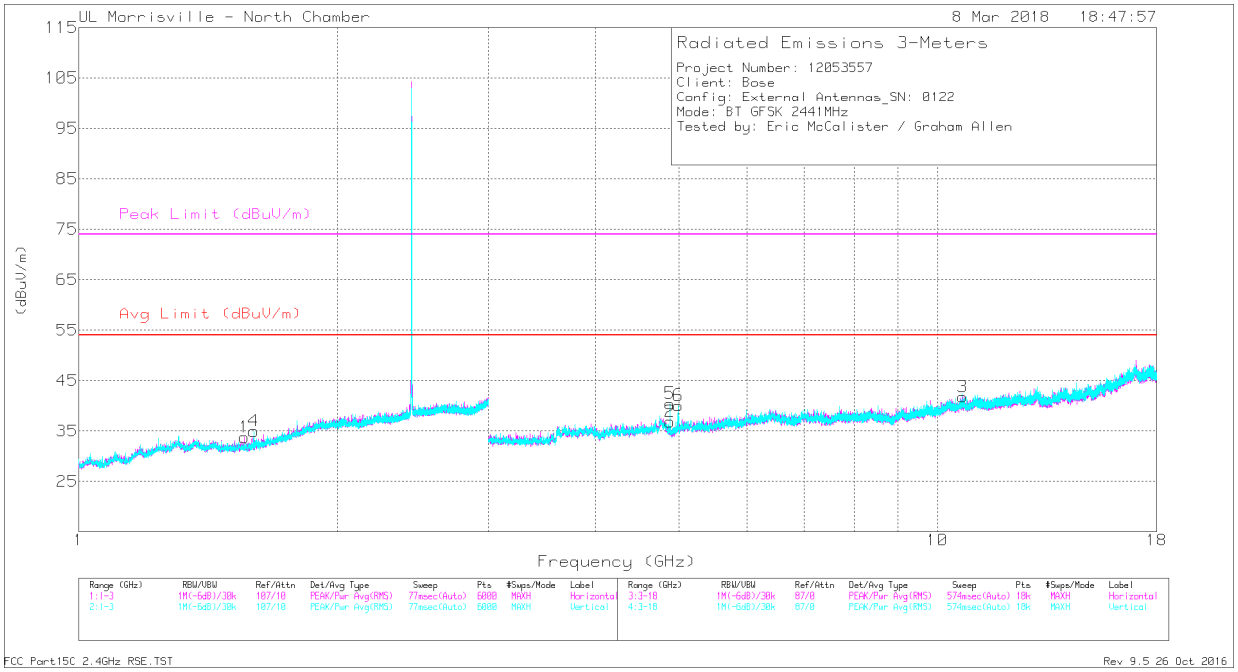
Low Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.595	43.5	PK-U	27.9	-24.1	47.3	-	-	74	-26.7	103	150	H
	* ** 1.595	26.42	V1TR	27.9	-24.1	30.22	54	-23.78	-	-	103	150	H
2	* ** 3.615	39.71	PK-U	32.9	-31	41.61	-	-	74	-32.39	254	275	H
	* ** 3.615	28.92	V1TR	32.9	-31	30.82	54	-23.18	-	-	254	275	H
3	* ** 4.993	47.35	PK-U	34.1	-32.2	49.25	-	-	74	-24.75	246	268	H
	* ** 4.992	29.71	V1TR	34.1	-32.2	31.61	54	-22.39	-	-	246	268	H
4	* ** 1.599	42	PK-U	28	-24.1	45.9	-	-	74	-28.1	317	145	V
	* ** 1.597	25.68	V1TR	28	-24.1	29.58	54	-24.42	-	-	317	145	V
5	* ** 4.984	53.48	PK-U	34.1	-32.2	55.38	-	-	74	-18.62	259	137	V
	* ** 4.984	31.45	V1TR	34.1	-32.2	33.35	54	-20.65	-	-	259	137	V
6	* ** 8.115	37.93	PK-U	35.9	-28.4	45.43	-	-	74	-28.57	334	156	V
	* ** 8.113	26	V1TR	35.9	-28.3	33.6	54	-20.4	-	-	334	156	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

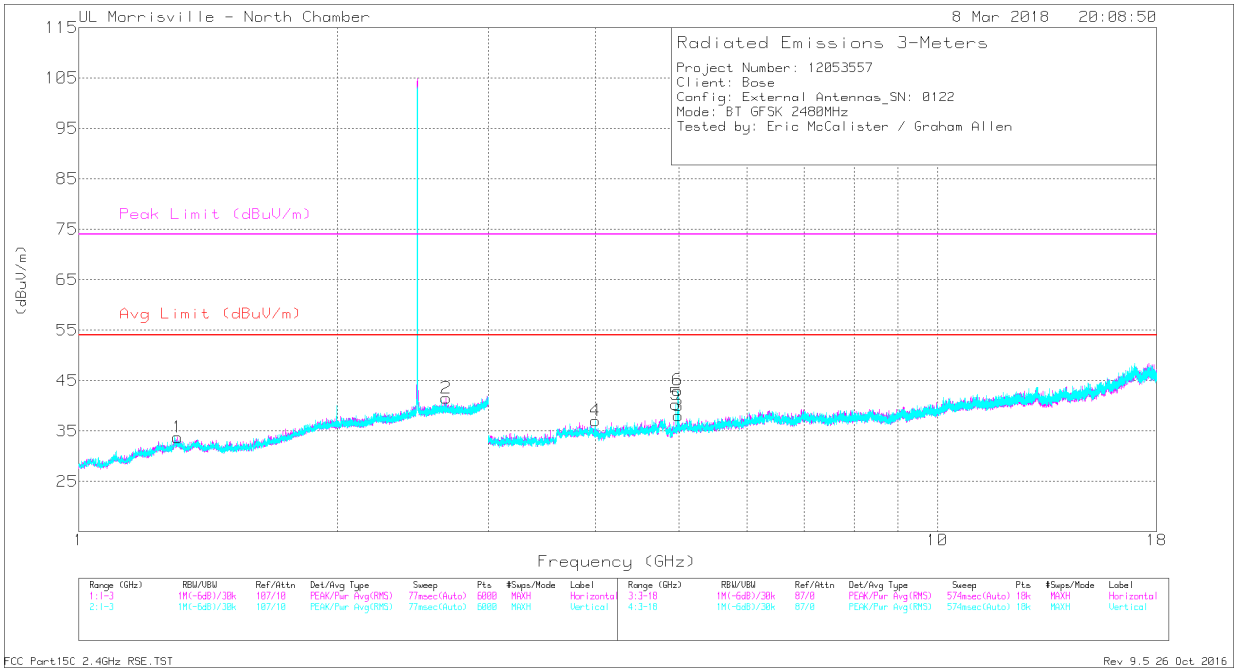
Mid Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.561	35.04	PK-U	27.9	-24.2	38.74	-	-	74	-35.26	355	144	H
	* ** 1.56	23.48	V1TR	27.9	-24.2	27.18	54	-26.82	-	-	355	144	H
2	* ** 4.882	40.52	PK-U	34	-31	43.52	-	-	74	-30.48	268	145	H
	* ** 4.882	33.6	V1TR	34	-31	36.6	54	-17.4	-	-	268	145	H
3	* ** 10.708	34.09	PK-U	37.8	-24.9	46.99	-	-	74	-27.01	105	177	H
	* ** 10.704	23.2	V1TR	37.8	-24.9	36.1	54	-17.9	-	-	105	177	H
4	* ** 1.6	37.83	PK-U	28	-24.1	41.73	-	-	74	-32.27	191	232	V
	* ** 1.598	23.92	V1TR	28	-24.1	27.82	54	-26.18	-	-	191	232	V
5	* ** 4.882	41.99	PK-U	34	-31	44.99	-	-	74	-29.01	138	344	V
	* ** 4.882	35.15	V1TR	34	-31	38.15	54	-15.85	-	-	138	344	V
6	* ** 4.99	54.07	PK-U	34.1	-32.2	55.97	-	-	74	-18.03	260	117	V
	* ** 4.988	32.51	V1TR	34.1	-32.2	34.41	54	-19.59	-	-	260	117	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

High Channel

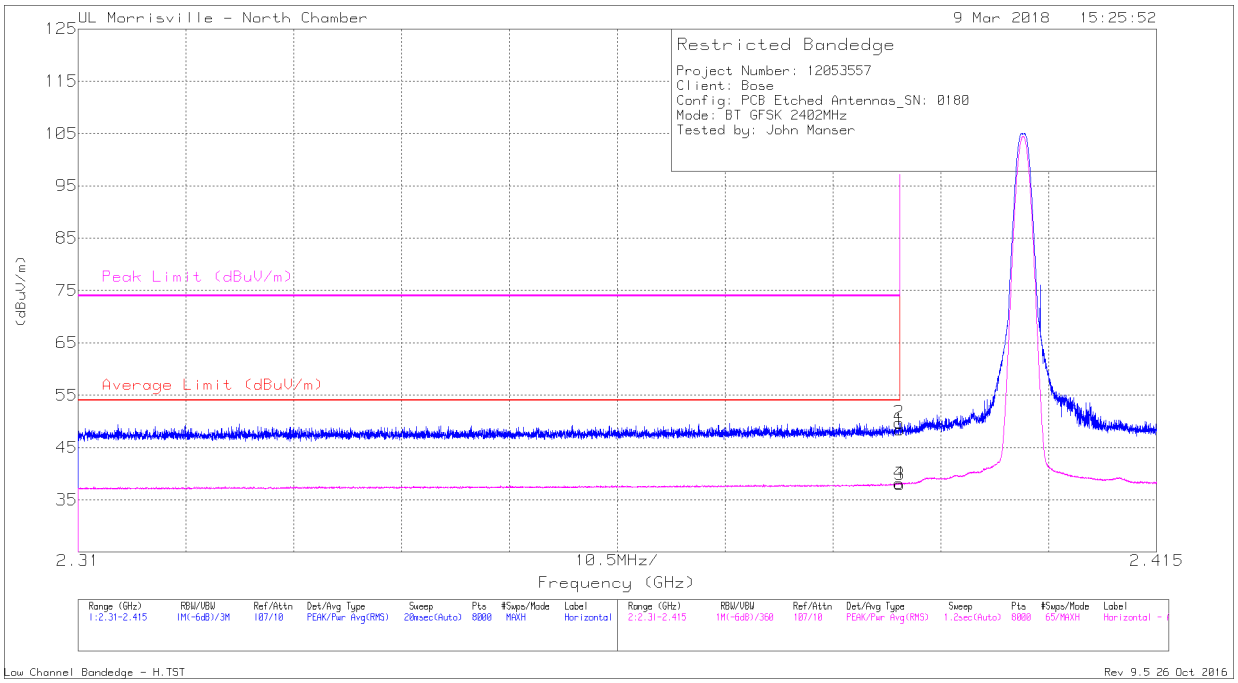


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.305	36.13	PK-U	29.3	-25.1	40.33	-	-	74	-33.67	55	357	H
	* ** 1.306	24.45	V1TR	29.3	-25.1	28.65	54	-25.35	-	-	55	357	H
2	* ** 2.68	37.39	PK-U	32.4	-23.5	46.29	-	-	74	-27.71	356	185	H
	* ** 2.68	25.12	V1TR	32.4	-23.5	34.02	54	-19.98	-	-	356	185	H
3	* ** 4.998	43.47	PK-U	34.1	-32.2	45.37	-	-	74	-28.63	283	156	H
	* ** 4.99	29.54	V1TR	34.1	-32.2	31.44	54	-22.56	-	-	283	156	H
4	* ** 3.999	41.23	PK-U	33.4	-31.6	43.03	-	-	74	-30.97	67	143	V
	* ** 3.998	28.59	V1TR	33.4	-31.6	30.39	54	-23.61	-	-	67	143	V
5	* ** 4.96	43.37	PK-U	34.1	-31.8	45.67	-	-	74	-28.33	118	234	V
	* ** 4.96	34.74	V1TR	34.1	-31.8	37.04	54	-16.96	-	-	118	234	V
6	* ** 4.985	53.97	PK-U	34.1	-32.2	55.87	-	-	74	-18.13	259	119	V
	* ** 4.983	31.6	V1TR	34.1	-32.2	33.5	54	-20.5	-	-	259	119	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

9.2.2. BASIC DATA RATE GFSK MODULATION PCB ANTENNA

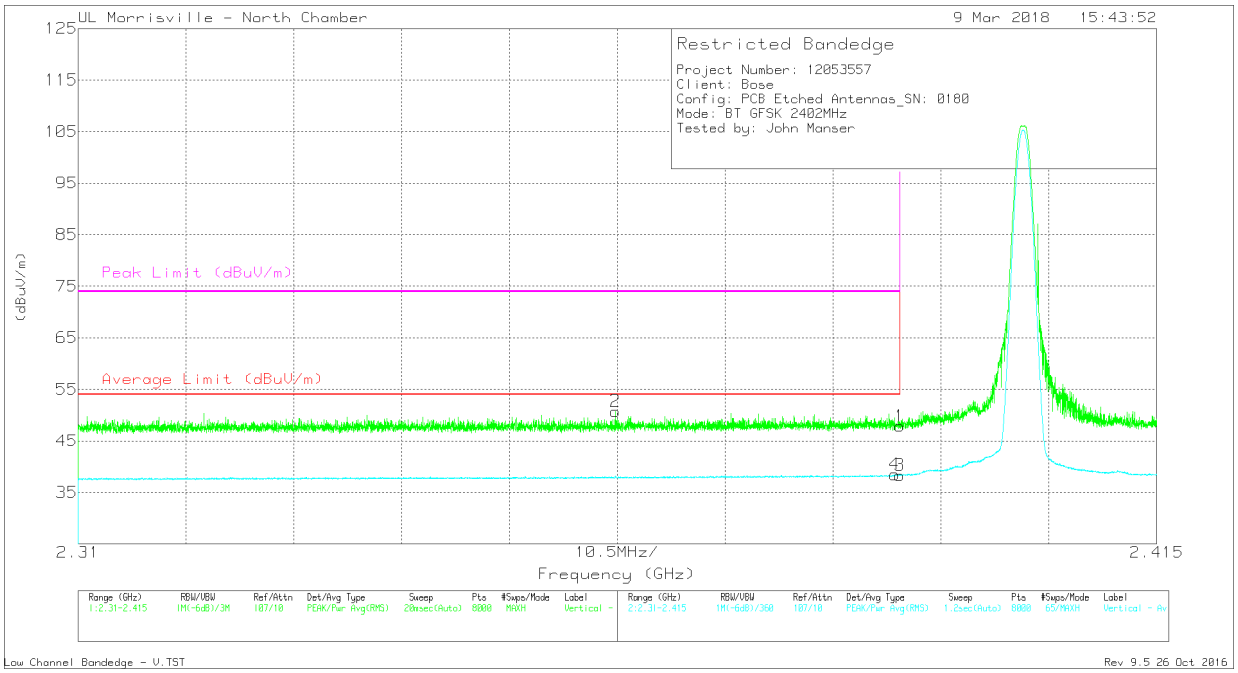
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	40.48	Pk	31.8	-23.9	48.38	-	-	74	-25.62	297	177	H
2	* ** 2.39	41.87	Pk	31.8	-23.9	49.77	-	-	74	-24.23	297	177	H
3	* ** 2.39	30.06	V1TR	31.8	-23.9	37.96	54	-16.04	-	-	297	177	H
4	* ** 2.39	30.27	V1TR	31.8	-23.9	38.17	54	-15.83	-	-	297	177	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

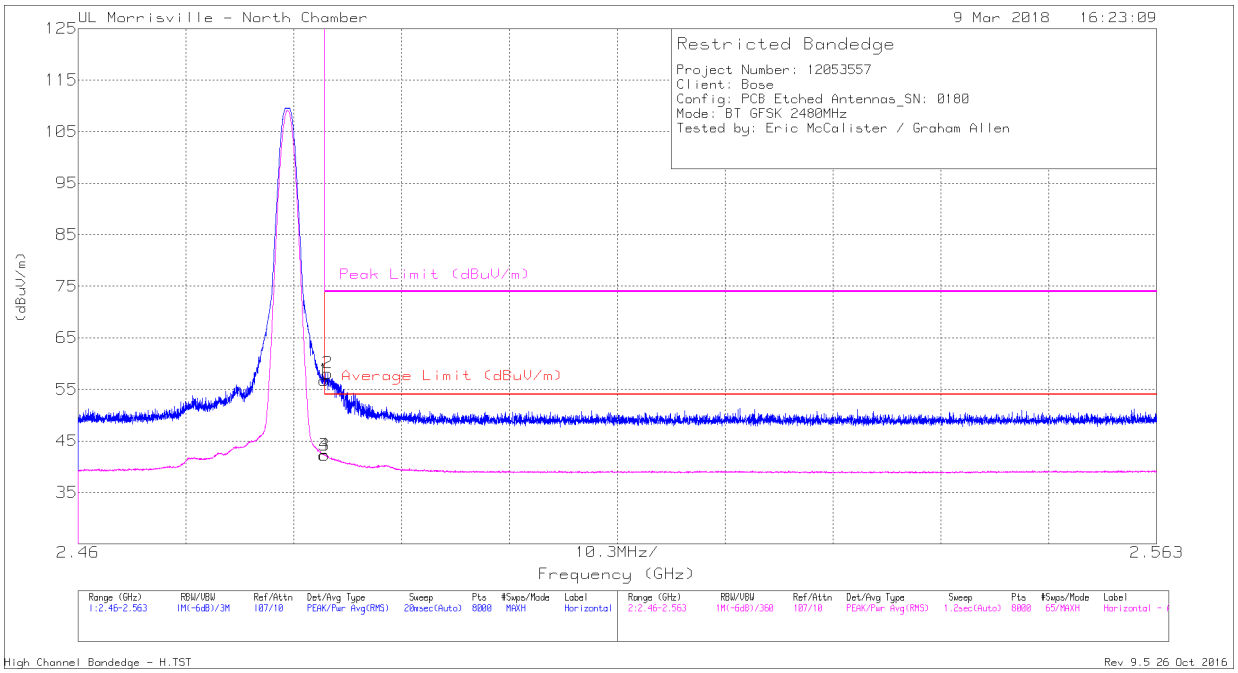
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	40.01	Pk	31.8	-23.9	47.91	-	-	74	-26.09	148	270	V
2	* ** 2.362	43.05	Pk	31.7	-24	50.75	-	-	74	-23.25	148	270	V
3	* ** 2.39	30.45	V1TR	31.8	-23.9	38.35	54	-15.65	-	-	148	270	V
4	* ** 2.389	30.59	V1TR	31.8	-23.9	38.49	54	-15.51	-	-	148	270	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

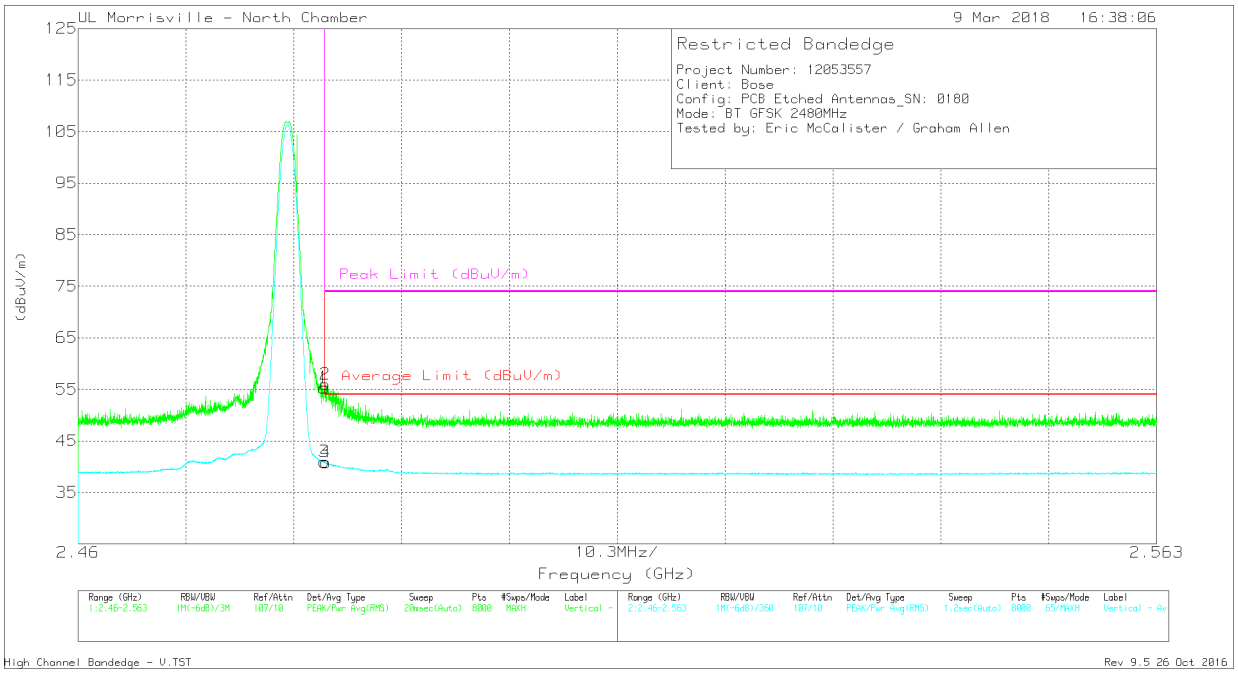
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	* ** 2.484	48.18	Pk	32.3	-23.7	56.78	-	-	74	-17.22	282	276	H
2	* ** 2.484	49.55	Pk	32.3	-23.7	58.15	-	-	74	-15.85	282	276	H
3	* ** 2.484	33.62	V1TR	32.3	-23.7	42.22	54	-11.78	-	-	282	276	H
4	* ** 2.484	33.7	V1TR	32.3	-23.7	42.3	54	-11.7	-	-	282	276	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

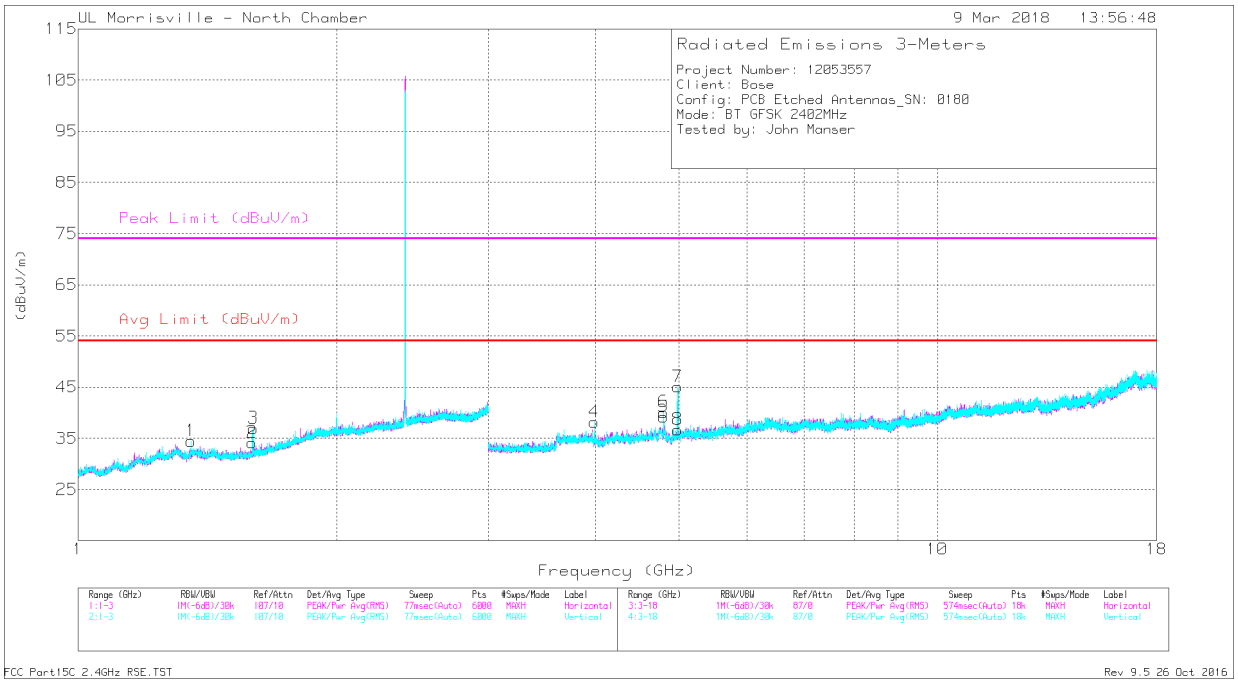


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.484	46.73	Pk	32.3	-23.7	55.33	-	-	74	-18.67	123	389	V
2	* ** 2.484	47.4	Pk	32.3	-23.7	56	-	-	74	-18	123	389	V
3	* ** 2.484	32.36	V1TR	32.3	-23.7	40.96	54	-13.04	-	-	123	389	V
4	* ** 2.484	32.23	V1TR	32.3	-23.7	40.83	54	-13.17	-	-	123	389	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

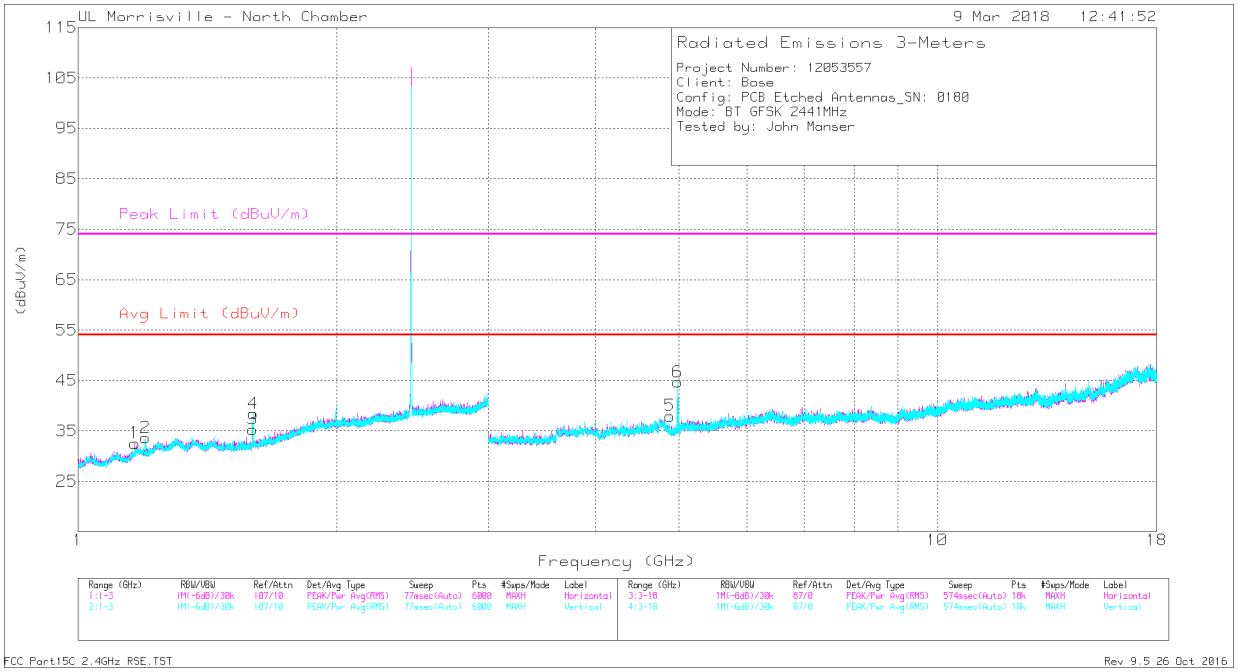
Low Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* ** 1.599	35.99	PK-U	28	-24.1	39.89	-	-	74	-34.11	228	343	H
	* ** 1.599	24.12	V1TR	28	-24.1	28.02	54	-25.98	-	-	228	343	H
1	* ** 1.363	36.04	PK-U	28.9	-24.9	40.04	-	-	74	-33.96	268	337	V
	* ** 1.362	24.84	V1TR	28.9	-24.9	28.84	54	-25.16	-	-	268	337	V
3	* ** 1.594	42.35	PK-U	27.9	-24.1	46.15	-	-	74	-27.85	242	283	V
	* ** 1.596	28.13	V1TR	27.9	-24.1	31.93	54	-22.07	-	-	242	283	V
5	* ** 4.804	42.83	PK-U	34.1	-31.1	45.83	-	-	74	-28.17	49	365	H
	* ** 4.804	33.54	V1TR	34.1	-31.1	36.54	54	-17.46	-	-	49	365	H
8	* ** 4.984	46.87	PK-U	34.1	-32.2	48.77	-	-	74	-25.23	246	154	H
	* ** 4.984	29.8	V1TR	34.1	-32.2	31.7	54	-22.3	-	-	246	154	H
4	* ** 3.997	40.49	PK-U	33.4	-31.6	42.29	-	-	74	-31.71	12	216	V
	* ** 3.998	28.53	V1TR	33.4	-31.6	30.33	54	-23.67	-	-	12	216	V
6	* ** 4.804	43.47	PK-U	34.1	-31.1	46.47	-	-	74	-27.53	141	117	V
	* ** 4.804	34.97	V1TR	34.1	-31.1	37.97	54	-16.03	-	-	141	117	V
7	* ** 4.981	51.8	PK-U	34.1	-32.1	53.8	-	-	74	-20.2	199	128	V
	* ** 4.995	31.56	V1TR	34.1	-32.2	33.46	54	-20.54	-	-	199	128	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

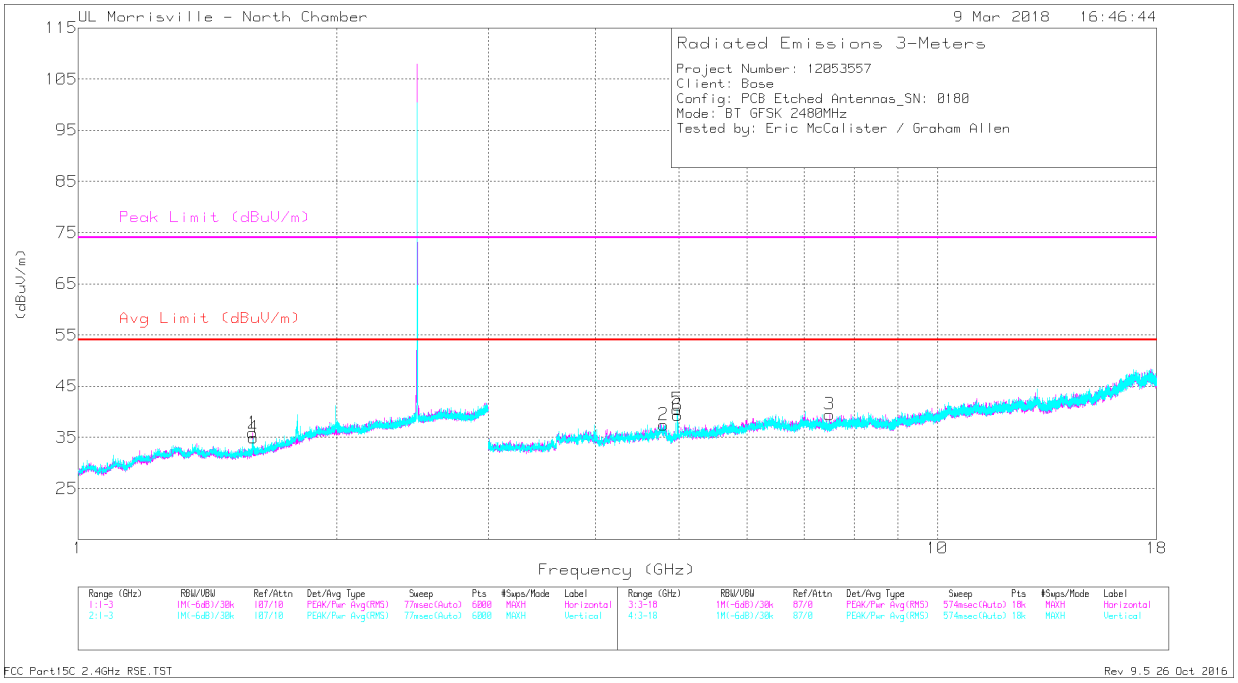
Mid Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.173	36.33	PK-U	28.2	-25.8	38.73	-	-	74	-35.27	184	184	H
	* ** 1.172	24	V1TR	28.2	-25.8	26.4	54	-27.6	-	-	184	184	H
3	* ** 1.596	44.41	PK-U	27.9	-24.1	48.21	-	-	74	-25.79	84	372	H
	* ** 1.597	27.9	V1TR	28	-24.1	31.8	54	-22.2	-	-	84	372	H
2	* ** 1.195	35.5	PK-U	28.4	-25.7	38.2	-	-	74	-35.8	190	298	V
	* ** 1.197	24.47	V1TR	28.5	-25.7	27.27	54	-26.73	-	-	190	298	V
4	* ** 1.595	37.37	PK-U	27.9	-24.1	41.17	-	-	74	-32.83	157	141	V
	* ** 1.598	25.17	V1TR	28	-24.1	29.07	54	-24.93	-	-	157	141	V
5	* ** 4.882	41.8	PK-U	34	-30.9	44.9	-	-	74	-29.1	125	194	V
	* ** 4.882	32.71	V1TR	34	-31	35.71	54	-18.29	-	-	125	194	V
6	* ** 4.98	53.65	PK-U	34.1	-32.1	55.65	-	-	74	-18.35	259	148	V
	* ** 4.981	32.84	V1TR	34.1	-32.1	34.84	54	-19.16	-	-	259	148	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

High Channel

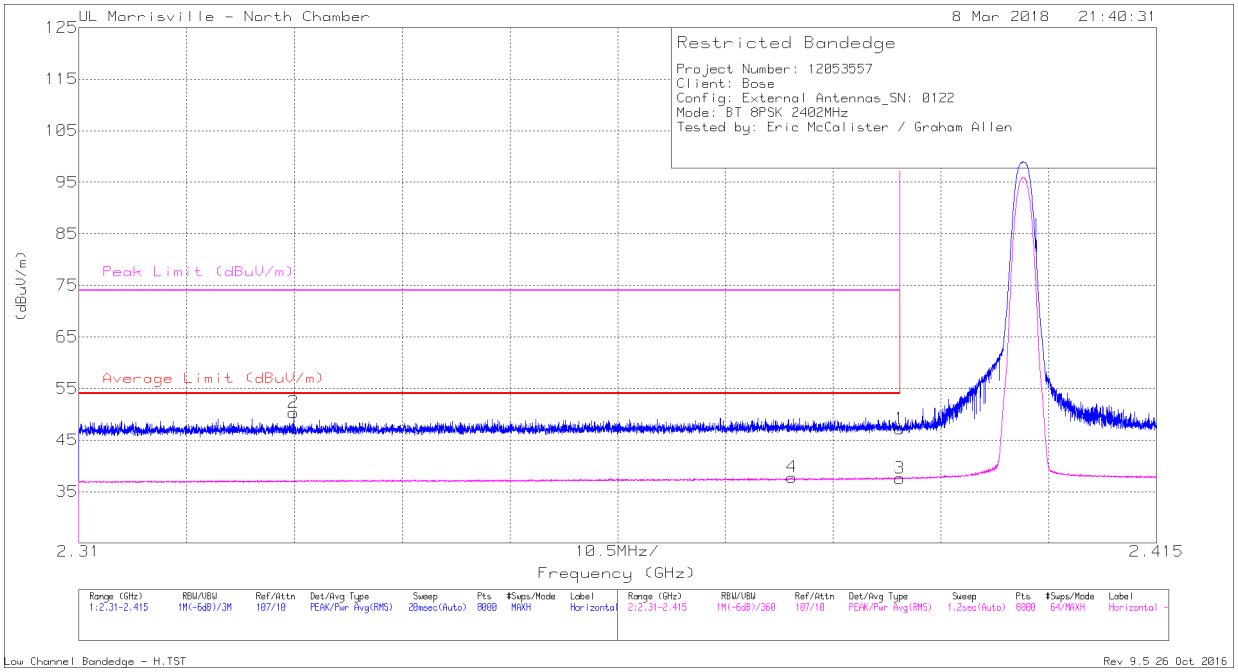


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.595	41	PK-U	27.9	-24.1	44.8	-	-	74	-29.2	40	244	H
	* ** 1.596	26.56	V1TR	28	-24.1	30.46	54	-23.54	-	-	40	244	H
2	* ** 4.802	40.76	PK-U	34.1	-31.1	43.76	-	-	74	-30.24	104	262	H
	* ** 4.8	29.55	V1TR	34.1	-31.2	32.45	54	-21.55	-	-	104	262	H
3	* ** 7.49	37.88	PK-U	35.6	-28.9	44.58	-	-	74	-29.42	4	126	H
	* ** 7.488	26.35	V1TR	35.6	-28.9	33.05	54	-20.95	-	-	4	126	H
4	* ** 1.6	42.64	PK-U	28	-24.1	46.54	-	-	74	-27.46	235	281	V
	* ** 1.598	27.54	V1TR	28	-24.1	31.44	54	-22.56	-	-	235	281	V
5	* ** 4.978	53.63	PK-U	34.1	-32.1	55.63	-	-	74	-18.37	266	116	V
	* ** 4.978	31.14	V1TR	34.1	-32.1	33.14	54	-20.86	-	-	266	116	V
6	* ** 4.985	46.31	PK-U	34.1	-32.2	48.21	-	-	74	-25.79	229	108	V
	* ** 4.985	29.26	V1TR	34.1	-32.2	31.16	54	-22.84	-	-	229	108	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

9.2.3. ENHANCED DATA RATE 8PSK MODULATION EXTERNAL ANTENNA

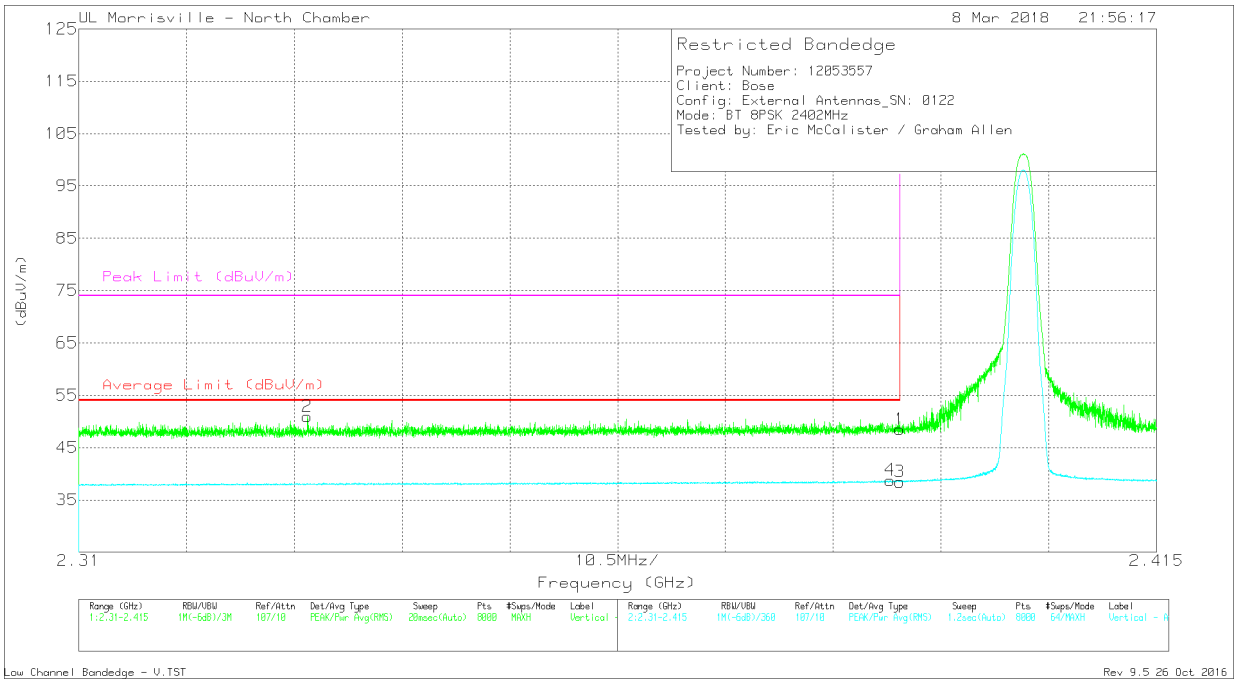
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	39.29	Pk	31.8	-23.9	47.19	-	-	74	-26.81	184	115	H
2	* ** 2.331	42.86	Pk	31.6	-24.1	50.36	-	-	74	-23.64	184	115	H
3	* ** 2.39	29.67	V1TR	31.8	-23.9	37.57	54	-16.43	-	-	184	115	H
4	* ** 2.379	29.9	V1TR	31.8	-23.9	37.8	54	-16.2	-	-	184	115	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

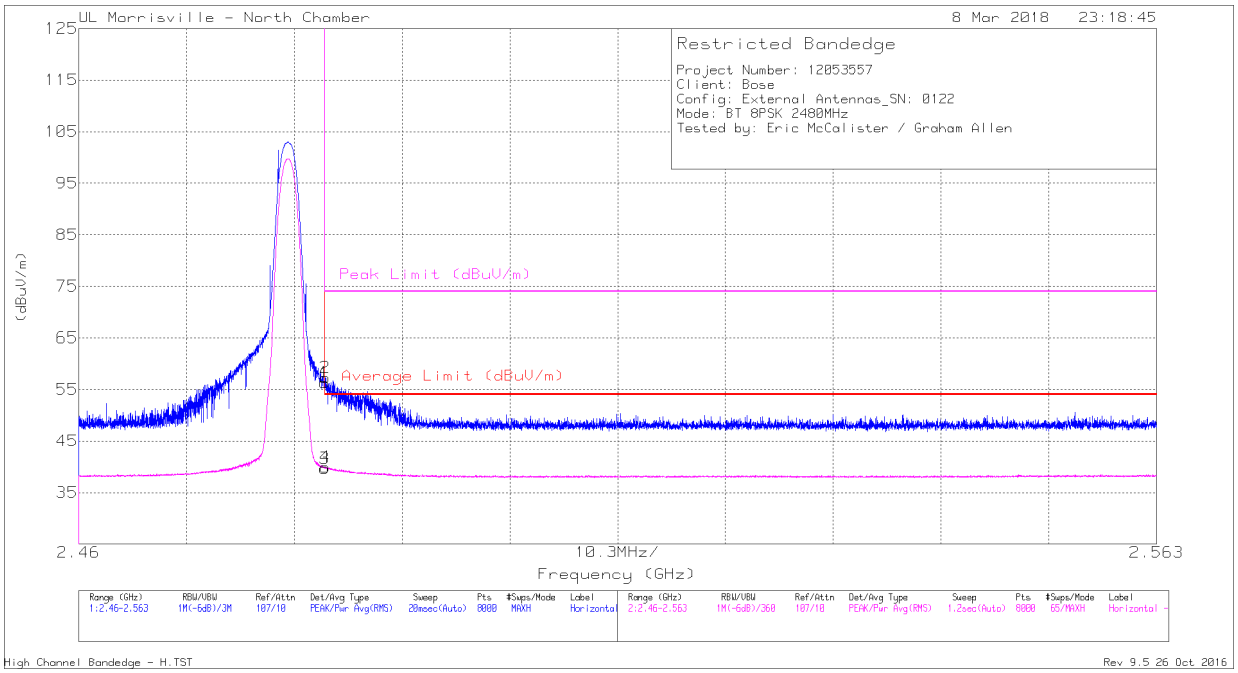
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	40.57	Pk	31.8	-23.9	48.47	-	-	74	-25.53	69	351	V
2	* ** 2.332	43.43	Pk	31.6	-24.1	50.93	-	-	74	-23.07	69	351	V
3	* ** 2.39	30.54	V1TR	31.8	-23.9	38.44	54	-15.56	-	-	69	351	V
4	* ** 2.389	30.86	V1TR	31.8	-23.9	38.76	54	-15.24	-	-	69	351	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

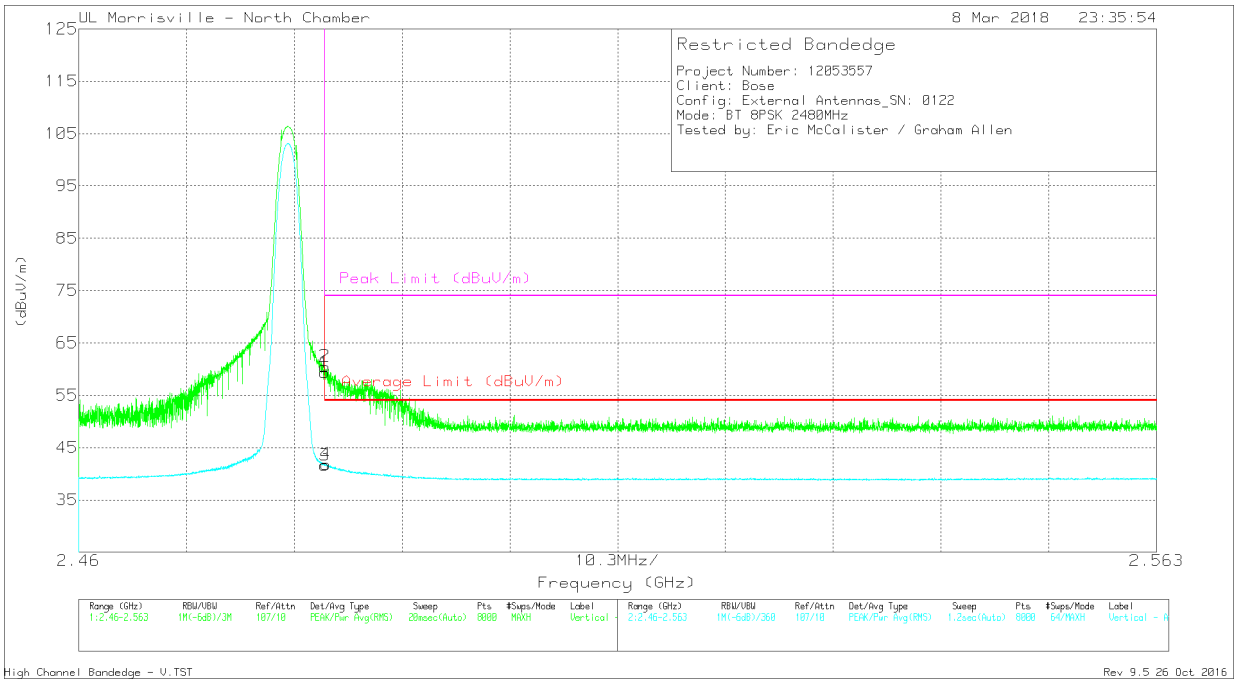
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	* ** 2.484	47.72	Pk	32.3	-23.7	56.32	-	-	74	-17.68	180	111	H
2	* ** 2.484	48.7	Pk	32.3	-23.7	57.3	-	-	74	-16.7	180	111	H
3	* ** 2.484	31.09	V1TR	32.3	-23.7	39.69	54	-14.31	-	-	180	111	H
4	* ** 2.484	31.33	V1TR	32.3	-23.7	39.93	54	-14.07	-	-	180	111	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

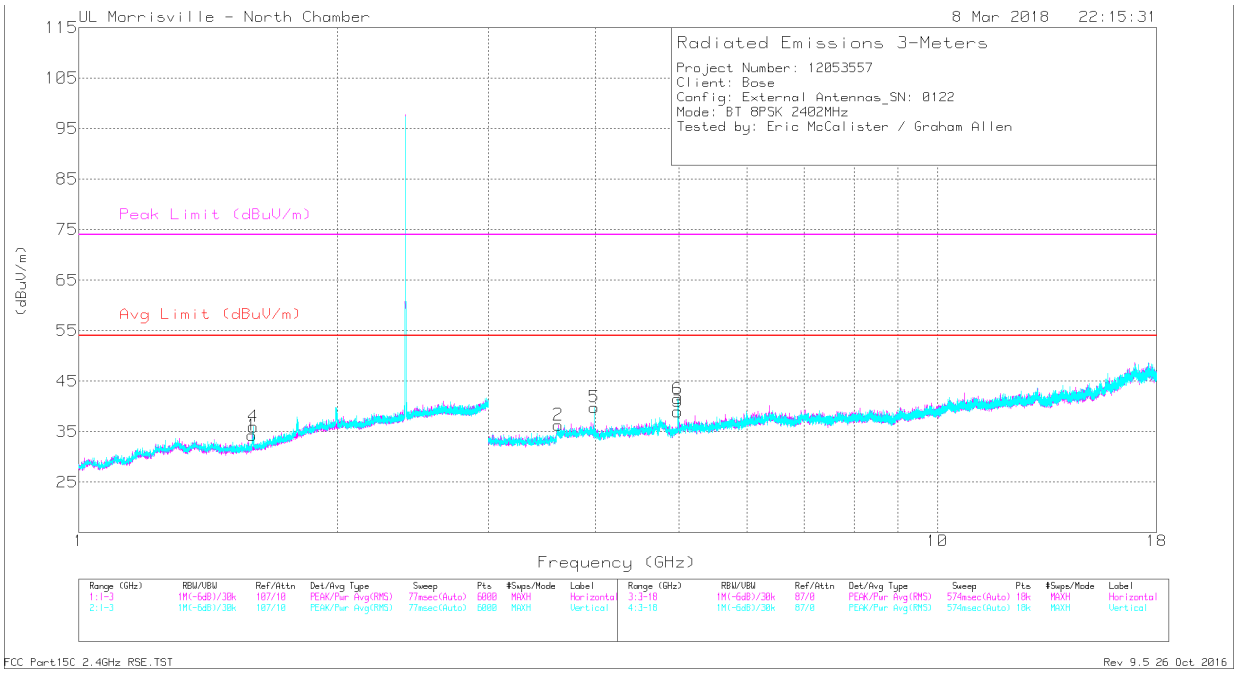


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.484	50.76	Pk	32.3	-23.7	59.36	-	-	74	-14.64	141	255	V
2	* ** 2.484	51.9	Pk	32.3	-23.7	60.5	-	-	74	-13.5	141	255	V
3	* ** 2.484	33.02	V1TR	32.3	-23.7	41.62	54	-12.38	-	-	141	255	V
4	* ** 2.484	33.21	V1TR	32.3	-23.7	41.81	54	-12.19	-	-	141	255	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

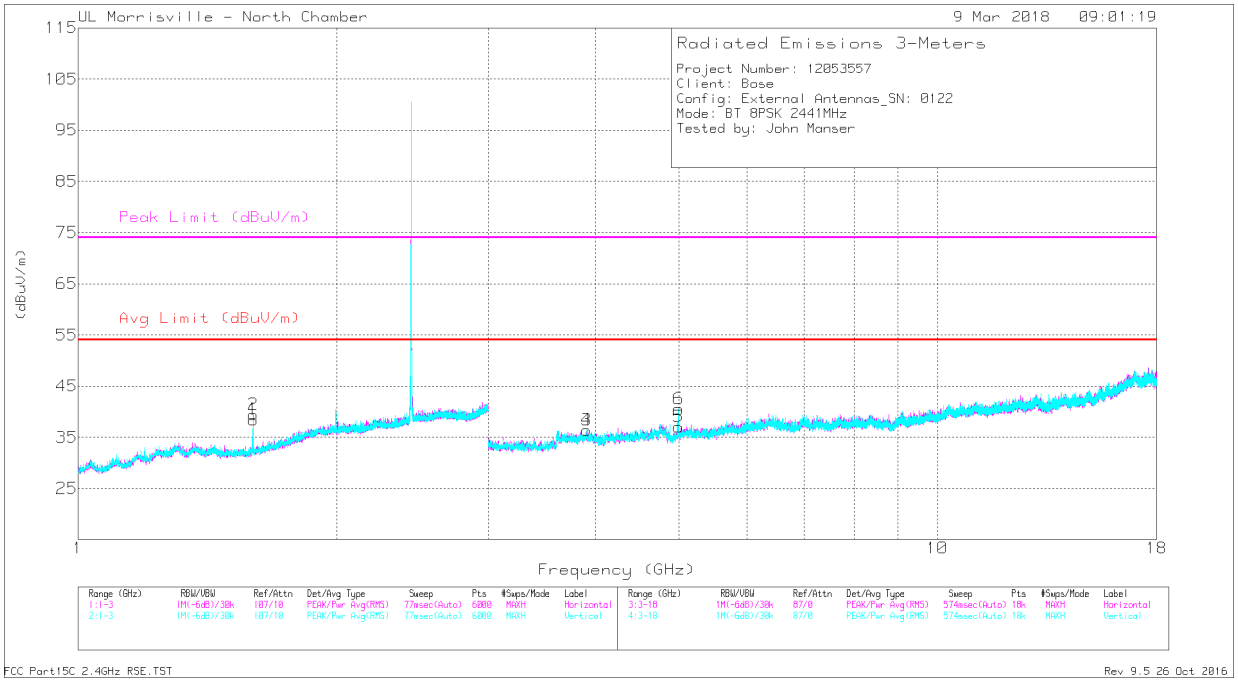
Low Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.595	41.54	PK-U	27.9	-24.1	45.34	-	-	74	-28.66	102	151	H
	* ** 1.595	26.08	V1TR	27.9	-24.1	29.88	54	-24.12	-	-	102	151	H
2	* ** 3.619	40.84	PK-U	32.8	-30.9	42.74	-	-	74	-31.26	323	113	H
	* ** 3.619	28.63	V1TR	32.8	-30.9	30.53	54	-23.47	-	-	323	113	H
3	* ** 4.988	45.65	PK-U	34.1	-32.2	47.55	-	-	74	-26.45	243	292	H
	* ** 4.987	29.29	V1TR	34.1	-32.2	31.19	54	-22.81	-	-	243	292	H
4	* ** 1.597	45.27	PK-U	28	-24.1	49.17	-	-	74	-24.83	22	320	V
	* ** 1.596	28.69	V1TR	28	-24.1	32.59	54	-21.41	-	-	22	320	V
5	* ** 3.98	41.19	PK-U	33.4	-31.2	43.39	-	-	74	-30.61	241	191	V
	* ** 3.983	28.78	V1TR	33.4	-31.3	30.88	54	-23.12	-	-	241	191	V
6	* ** 4.981	53.01	PK-U	34.1	-32.1	55.01	-	-	74	-18.99	258	213	V
	* ** 4.981	31.88	V1TR	34.1	-32.1	33.88	54	-20.12	-	-	258	213	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

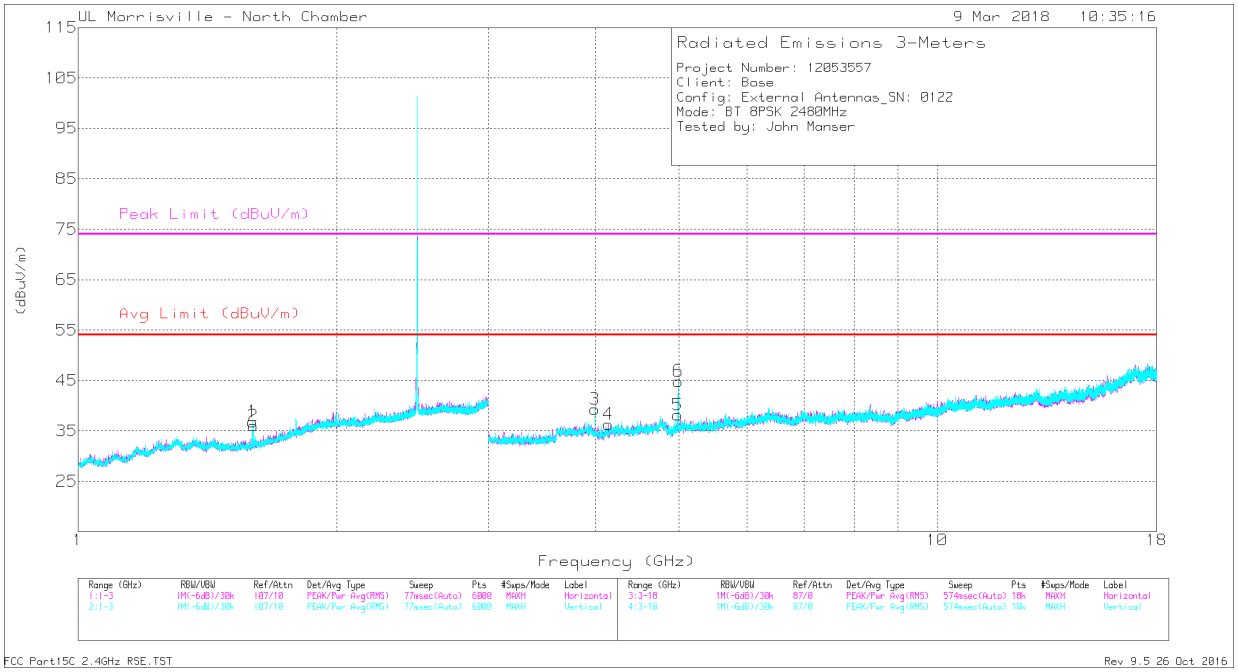
Mid Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* ** 1.596	38.73	PK-U	28	-24.1	42.63	-	-	74	-31.37	168	157	H
	* ** 1.598	24.14	V1TR	28	-24.1	28.04	54	-25.96	-	-	168	157	H
1	* ** 1.6	41.3	PK-U	28	-24.1	45.2	-	-	74	-28.8	312	113	V
	* ** 1.595	24.69	V1TR	27.9	-24.1	28.49	54	-25.51	-	-	312	113	V
3	* ** 3.891	40.73	PK-U	33.4	-31.3	42.83	-	-	74	-31.17	196	278	H
	* ** 3.89	29.34	V1TR	33.4	-31.3	31.44	54	-22.56	-	-	196	278	H
5	* ** 4.978	40.59	PK-U	34.1	-32.1	42.59	-	-	74	-31.41	229	197	H
	* ** 4.978	29.23	V1TR	34.1	-32.1	31.23	54	-22.77	-	-	229	197	H
4	* ** 3.892	40.8	PK-U	33.4	-31.3	42.9	-	-	74	-31.1	49	264	V
	* ** 3.89	29.41	V1TR	33.4	-31.3	31.51	54	-22.49	-	-	49	264	V
6	* ** 4.998	47.56	PK-U	34.1	-32.2	49.46	-	-	74	-24.54	102	128	V
	* ** 4.992	30.2	V1TR	34.1	-32.2	32.1	54	-21.9	-	-	102	128	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

High Channel

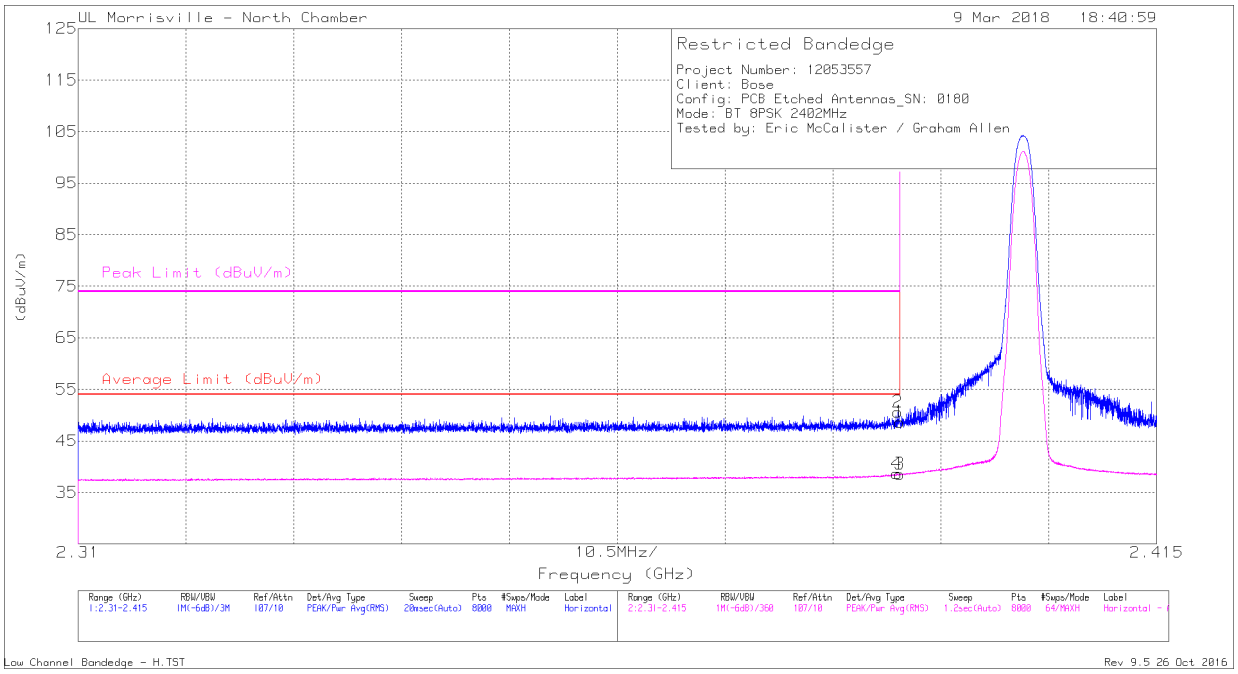


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* ** 1.6	42.44	PK-U	28	-24.1	46.34	-	-	74	-27.66	96	297	H
	* ** 1.597	25.24	V1TR	28	-24.1	29.14	54	-24.86	-	-	96	297	H
1	* ** 1.595	42.72	PK-U	27.9	-24.1	46.52	-	-	74	-27.48	231	226	V
	* ** 1.599	25.28	V1TR	28	-24.1	29.18	54	-24.82	-	-	231	226	V
4	* ** 4.13	40.13	PK-U	33.4	-31.9	41.63	-	-	74	-32.37	307	145	H
	* ** 4.13	29.13	V1TR	33.4	-31.9	30.63	54	-23.37	-	-	307	145	H
5	* ** 4.993	41.31	PK-U	34.1	-32.2	43.21	-	-	74	-30.79	201	190	H
	* ** 4.991	29.47	V1TR	34.1	-32.2	31.37	54	-22.63	-	-	201	190	H
3	* ** 3.994	45.35	PK-U	33.4	-31.5	47.25	-	-	74	-26.75	229	139	V
	* ** 3.988	29.19	V1TR	33.4	-31.4	31.19	54	-22.81	-	-	229	139	V
6	* ** 4.982	52.43	PK-U	34.1	-32.1	54.43	-	-	74	-19.57	262	133	V
	* ** 4.992	32.43	V1TR	34.1	-32.2	34.33	54	-19.67	-	-	262	133	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

9.2.4. ENHANCED DATA RATE 8PSK MODULATION PCB ANTENNA

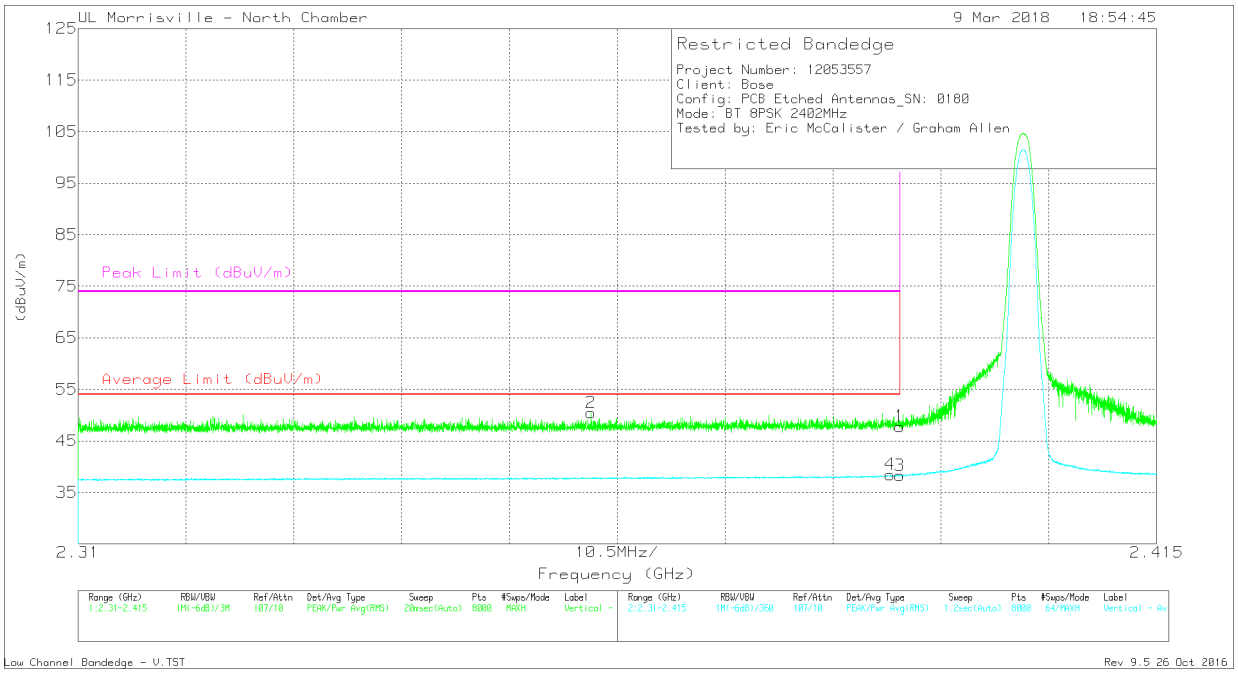
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	40.77	Pk	31.8	-23.9	48.67	-	-	74	-25.33	296	239	H
2	* ** 2.39	42.72	Pk	31.8	-23.9	50.62	-	-	74	-23.38	296	239	H
3	* ** 2.39	30.7	V1TR	31.8	-23.9	38.6	54	-15.4	-	-	296	239	H
4	* ** 2.39	30.75	V1TR	31.8	-23.9	38.65	54	-15.35	-	-	296	239	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

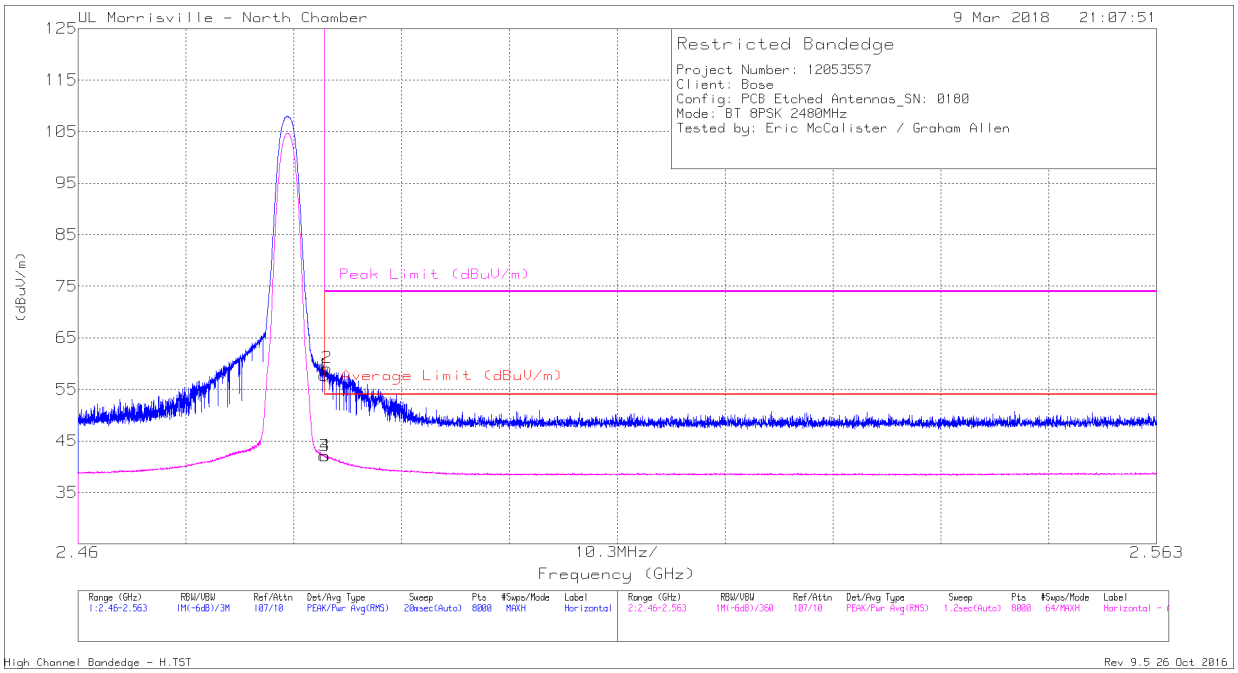
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	39.91	Pk	31.8	-23.9	47.81	-	-	74	-26.19	152	284	V
2	* ** 2.36	42.74	Pk	31.7	-24	50.44	-	-	74	-23.56	152	284	V
3	* ** 2.39	30.39	V1TR	31.8	-23.9	38.29	54	-15.71	-	-	152	284	V
4	* ** 2.389	30.57	V1TR	31.8	-23.9	38.47	54	-15.53	-	-	152	284	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

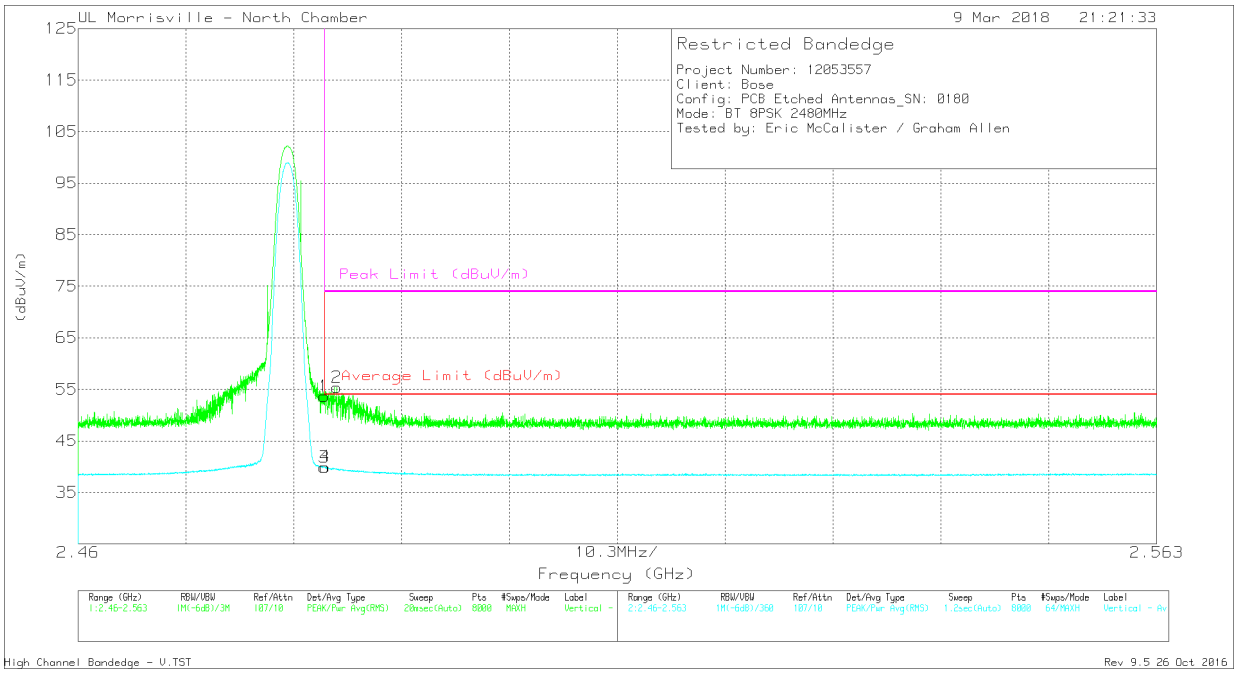
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (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	* ** 2.484	49.16	Pk	32.3	-23.7	57.76	-	-	74	-16.24	278	363	H
2	* ** 2.484	50.53	Pk	32.3	-23.7	59.13	-	-	74	-14.87	278	363	H
3	* ** 2.484	33.51	V1TR	32.3	-23.7	42.11	54	-11.89	-	-	278	363	H
4	* ** 2.484	33.53	V1TR	32.3	-23.7	42.13	54	-11.87	-	-	278	363	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

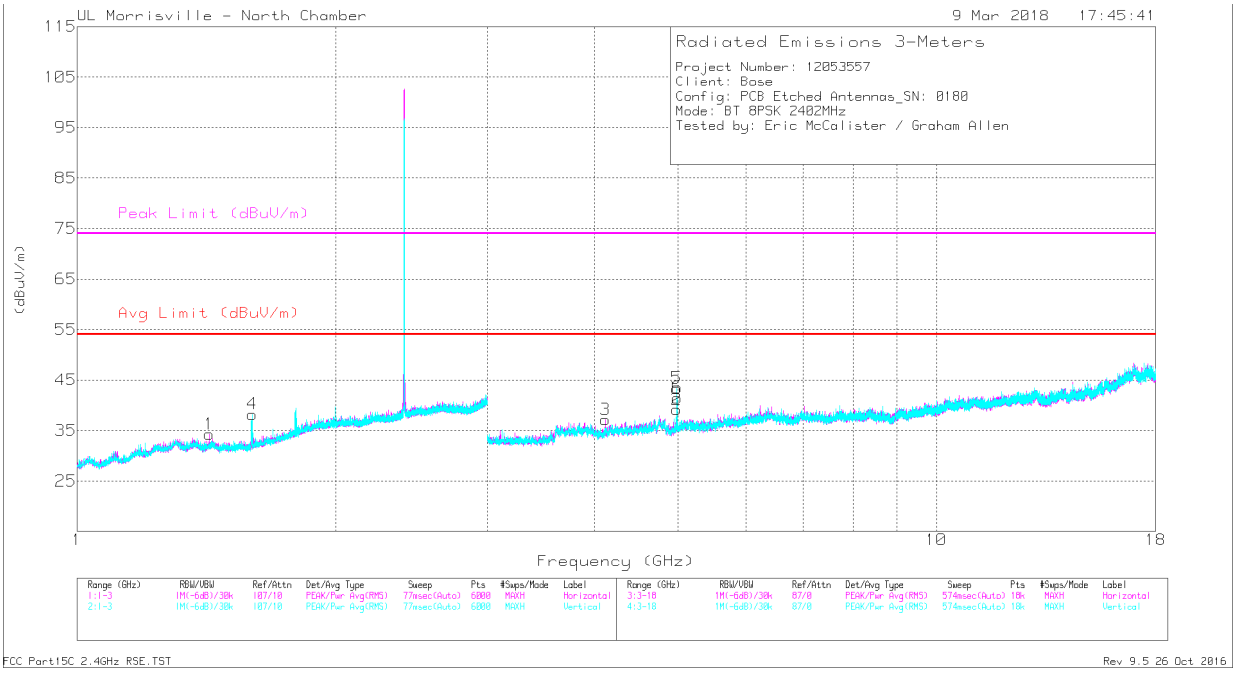


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.484	45.05	Pk	32.3	-23.7	53.65	-	-	74	-20.35	154	372	V
2	* ** 2.485	46.78	Pk	32.3	-23.7	55.38	-	-	74	-18.62	154	372	V
3	* ** 2.484	31.3	V1TR	32.3	-23.7	39.9	54	-14.1	-	-	154	372	V
4	* ** 2.484	31.36	V1TR	32.3	-23.7	39.96	54	-14.04	-	-	154	372	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

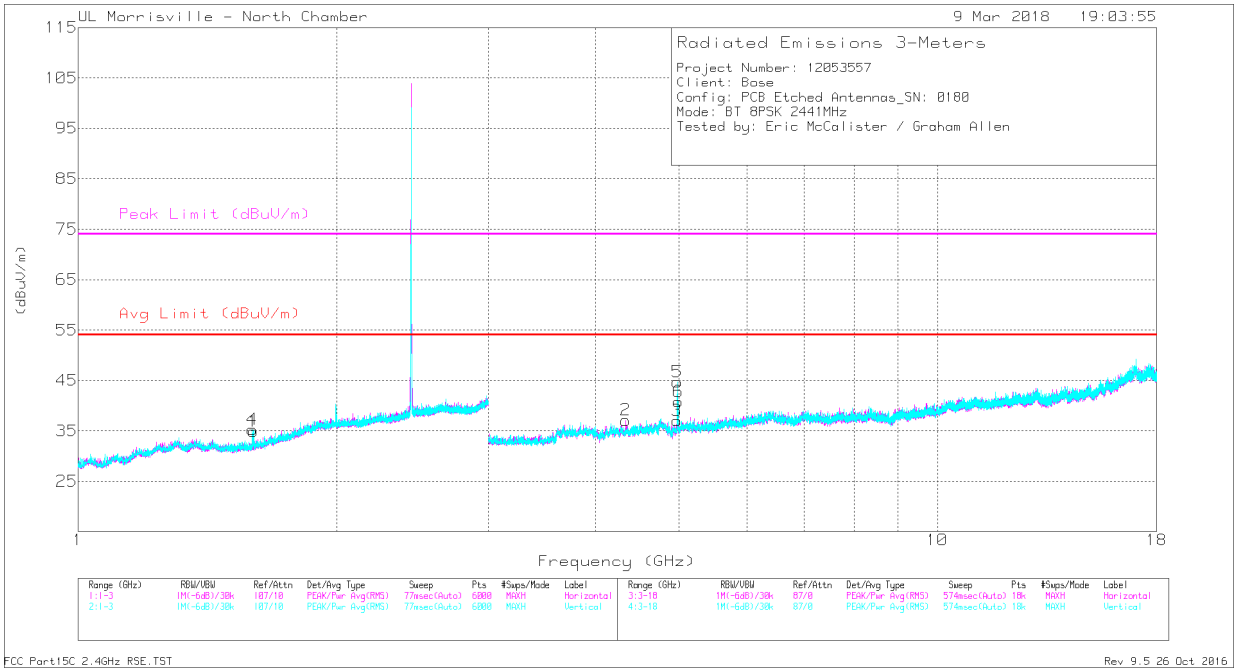
Low Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.423	35.02	PK-U	28.6	-24.7	38.92	-	-	74	-35.08	312	202	H
	* ** 1.424	23.52	V1TR	28.6	-24.7	27.42	54	-26.58	-	-	312	202	H
2	* ** 4.99	40.72	PK-U	34.1	-32.2	42.62	-	-	74	-31.38	333	214	H
	* ** 4.987	29.26	V1TR	34.1	-32.2	31.16	54	-22.84	-	-	333	214	H
3	* ** 4.119	41.11	PK-U	33.4	-32.1	42.41	-	-	74	-31.59	355	391	H
	* ** 4.118	29.75	V1TR	33.4	-32.1	31.05	54	-22.95	-	-	355	391	H
4	* ** 1.599	40.07	PK-U	28	-24.1	43.97	-	-	74	-30.03	241	186	V
	* ** 1.599	23.96	V1TR	28	-24.1	27.86	54	-26.14	-	-	241	186	V
5	* ** 4.987	49.63	PK-U	34.1	-32.2	51.53	-	-	74	-22.47	356	110	V
	* ** 4.986	30.22	V1TR	34.1	-32.2	32.12	54	-21.88	-	-	356	110	V
6	* ** 4.998	53.27	PK-U	34.1	-32.2	55.17	-	-	74	-18.83	262	115	V
	* ** 4.999	30.62	V1TR	34.1	-32.2	32.52	54	-21.48	-	-	262	115	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

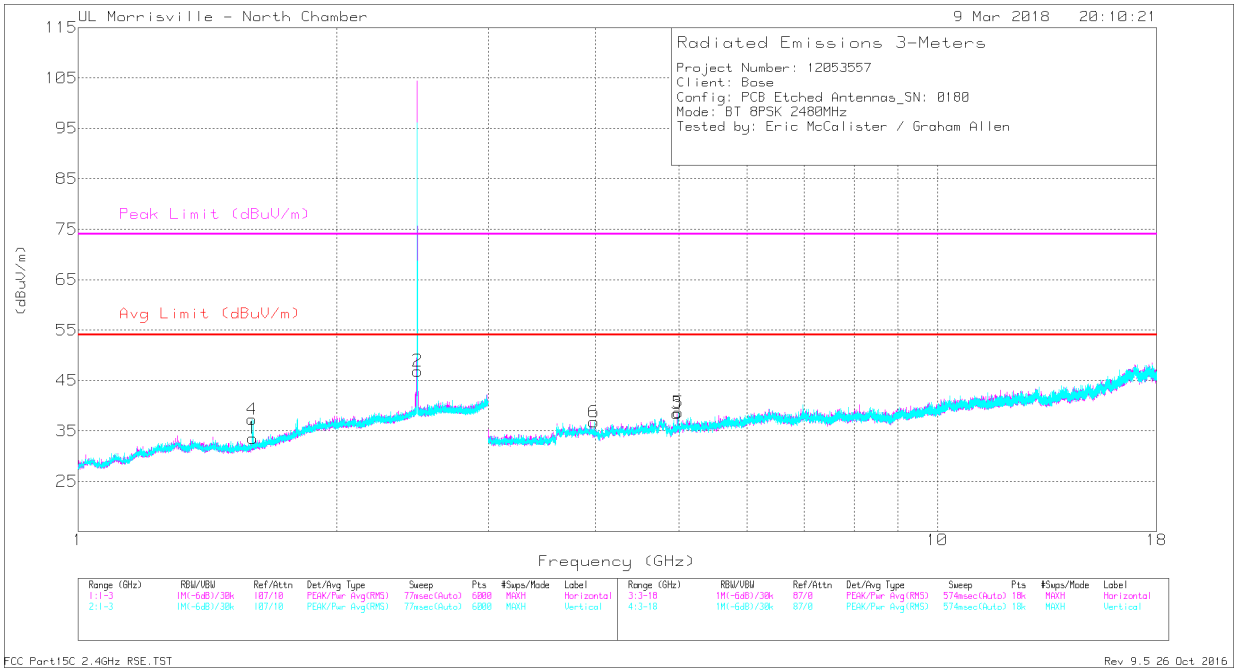
Mid Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.598	38.6	PK-U	28	-24.1	42.5	-	-	74	-31.5	65	171	H
	* ** 1.6	23.9	V1TR	28	-24.1	27.8	54	-26.2	-	-	65	171	H
2	* ** 4.338	40.66	PK-U	33.6	-31.9	42.36	-	-	74	-31.64	348	324	H
	* ** 4.337	29.19	V1TR	33.6	-31.9	30.89	54	-23.11	-	-	348	324	H
3	* ** 4.98	45.14	PK-U	34.1	-32.1	47.14	-	-	74	-26.86	291	228	H
	* ** 4.979	29.1	V1TR	34.1	-32.1	31.1	54	-22.9	-	-	291	228	H
4	* ** 1.594	39.51	PK-U	27.9	-24.1	43.31	-	-	74	-30.69	240	183	V
	* ** 1.595	26.45	V1TR	27.9	-24.1	30.25	54	-23.75	-	-	240	183	V
5	* ** 4.982	54.46	PK-U	34.1	-32.1	56.46	-	-	74	-17.54	266	187	V
	* ** 4.984	31.53	V1TR	34.1	-32.2	33.43	54	-20.57	-	-	266	187	V
6	* ** 4.996	48.19	PK-U	34.1	-32.2	50.09	-	-	74	-23.91	220	294	V
	* ** 4.997	29.62	V1TR	34.1	-32.2	31.52	54	-22.48	-	-	220	294	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

High Channel



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 AF (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.597	38.81	PK-U	28	-24.1	42.71	-	-	74	-31.29	96	212	H
	* ** 1.598	23.74	V1TR	28	-24.1	27.64	54	-26.36	-	-	96	212	H
2	* ** 2.484	45.51	PK-U	32.3	-23.8	54.01	-	-	74	-19.99	65	183	H
	* ** 2.484	28.16	V1TR	32.3	-23.8	36.66	54	-17.34	-	-	65	183	H
3	* ** 4.981	45.35	PK-U	34.1	-32.1	47.35	-	-	74	-26.65	255	213	H
	* ** 4.981	29.21	V1TR	34.1	-32.1	31.21	54	-22.79	-	-	255	213	H
4	* ** 1.594	40.85	PK-U	27.9	-24.1	44.65	-	-	74	-29.35	197	170	V
	* ** 1.595	25.17	V1TR	27.9	-24.1	28.97	54	-25.03	-	-	197	170	V
5	* ** 4.993	48.5	PK-U	34.1	-32.2	50.4	-	-	74	-23.6	204	107	V
	* ** 4.995	29.57	V1TR	34.1	-32.2	31.47	54	-22.53	-	-	204	107	V
6	* ** 3.984	46.81	PK-U	33.4	-31.3	48.91	-	-	74	-25.09	305	102	V
	* ** 3.985	28.94	V1TR	33.4	-31.3	31.04	54	-22.96	-	-	305	102	V

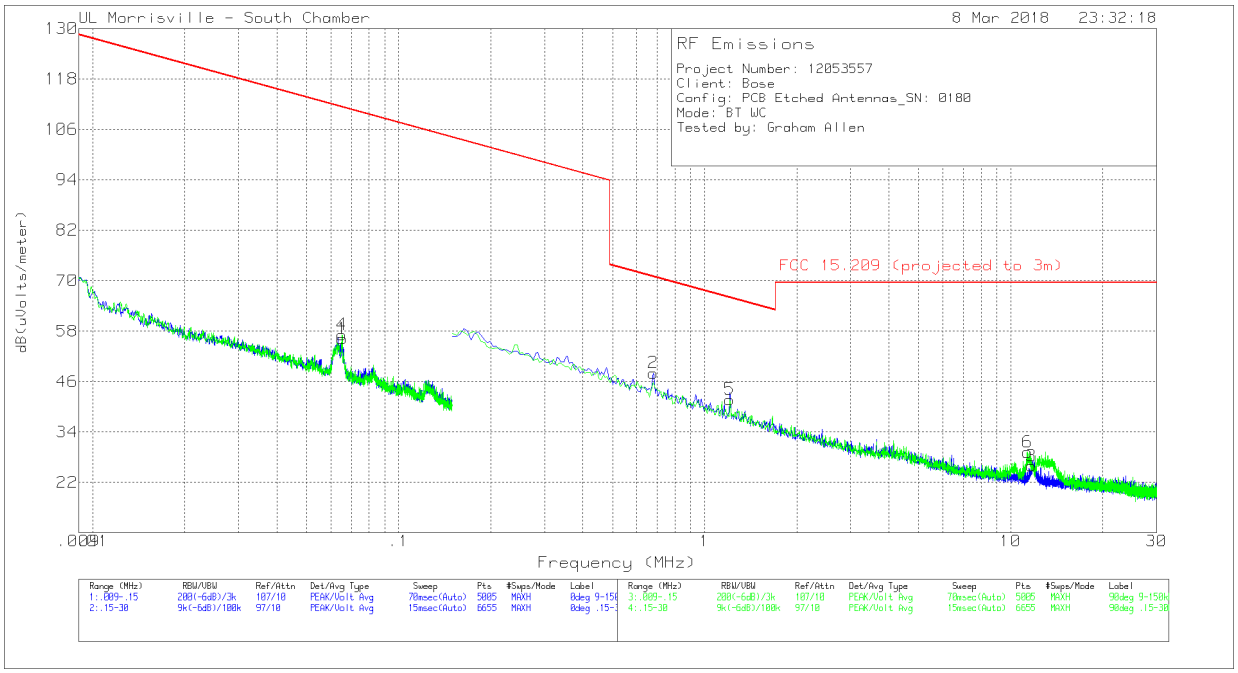
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton where: Ton is packet duration

9.3. RADIATED WORST-CASE

SPURIOUS EMISSIONS 0.009 TO 30 MHz (WORST-CASE CONFIGURATION, PCB ANT)

Note: All measurements were made at a test distance of 3 m. The limits in the plots and tabular data are the FCC/IC limits extrapolated from the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to the measurement distance to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (specification distance / test distance).

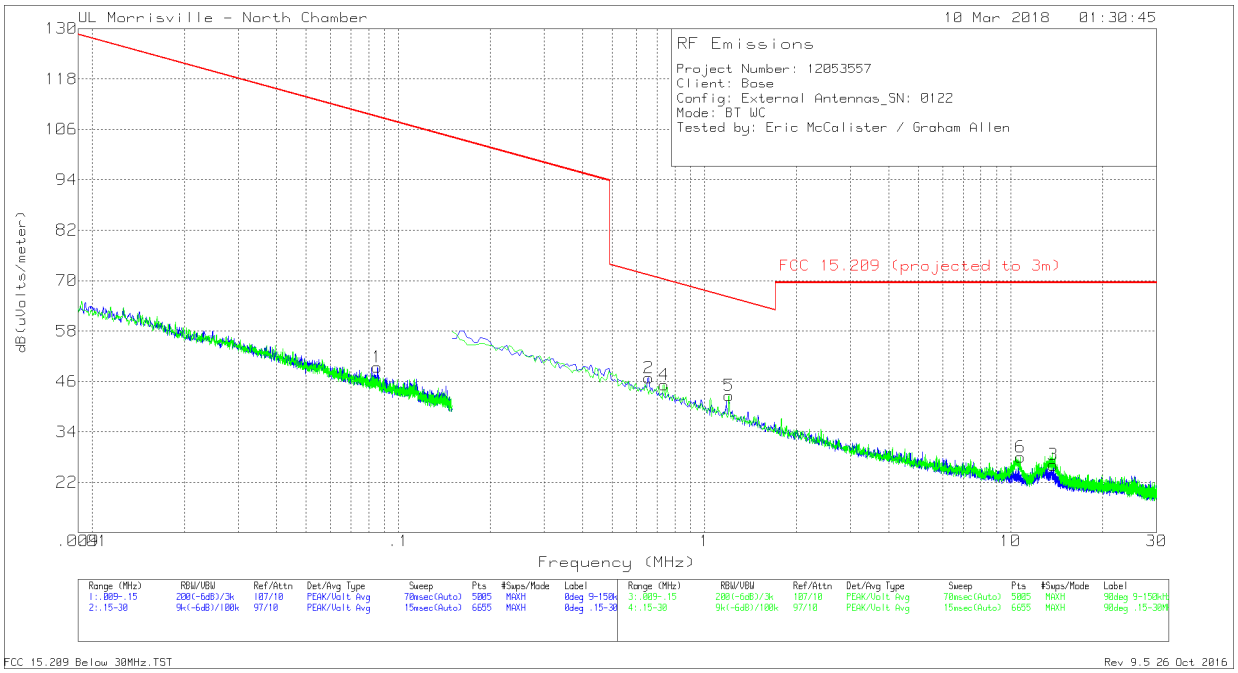
Although these tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against an open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uV/m)	FCC 15.209 QP Limit (projected to 3m)	QP Margin (dB)	FCC 15.209 AV Limit (projected to 3m)	AV Margin (dB)	FCC 15.209 PK Limit (projected to 3m)	PK Margin (dB)	Azimuth (Degs)
1	.06545	44.33	Pk	11.8	.1	56.23	-	-	111.29	-55.06	131.29	-75.06	0-360
2	.67935	36.45	Pk	11.5	.1	48.05	70.96	-22.91	-	-	-	-	0-360
3	11.68351	14.62	Pk	10.7	.6	25.92	69.54	-43.62	-	-	-	-	0-360
4	.06531	45.26	Pk	11.8	.1	57.16	-	-	111.31	-54.15	131.31	-74.15	0-360
5	1.2087	30.05	Pk	11.5	.2	41.75	65.96	-24.21	-	-	-	-	0-360
6	11.36051	18	Pk	10.7	.5	29.2	69.54	-40.34	-	-	-	-	0-360

Pk - Peak detector

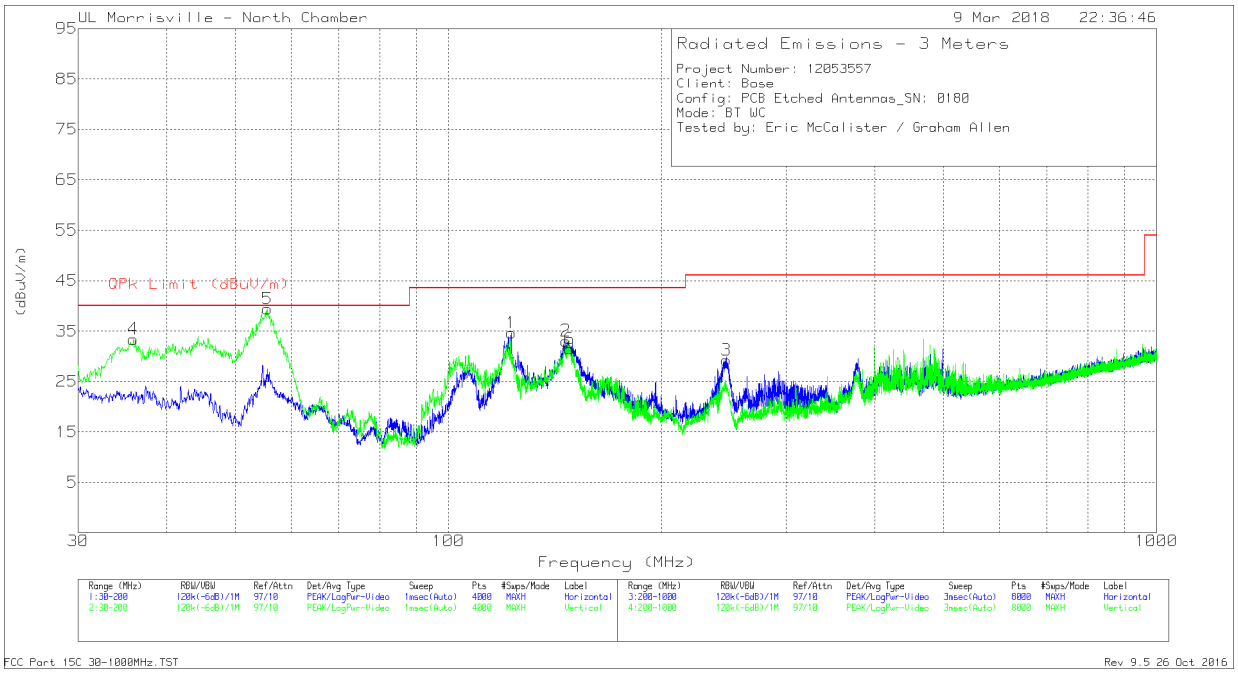
SPURIOUS EMISSIONS 0.009 TO 30 MHz (WORST-CASE CONFIGURATION, EXTERNAL ANT)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uV/m)	FCC 15.209 QP Limit (projected to 3m)	QP Margin (dB)	FCC 15.209 AV Limit (projected to 3m)	AV Margin (dB)	FCC 15.209 PK Limit (projected to 3m)	PK Margin (dB)	Azimuth (Degs)
1	.08547	37.69	Pk	11.6	.1	49.39	-	-	108.97	-59.58	128.97	-79.58	0-360
2	.65692	35.28	Pk	11.5	.1	46.88	71.25	-24.37	-	-	-	-	0-360
4	.73767	33.61	Pk	11.5	.1	45.21	70.25	-25.04	-	-	-	-	0-360
5	1.20421	30.88	Pk	11.5	.2	42.58	65.99	-23.41	-	-	-	-	0-360
6	10.75939	16.68	Pk	10.8	.5	27.98	69.54	-41.56	-	-	-	-	0-360
3	13.80538	15.14	Pk	10.4	.6	26.14	69.54	-43.4	-	-	-	-	0-360

Pk - Peak detector

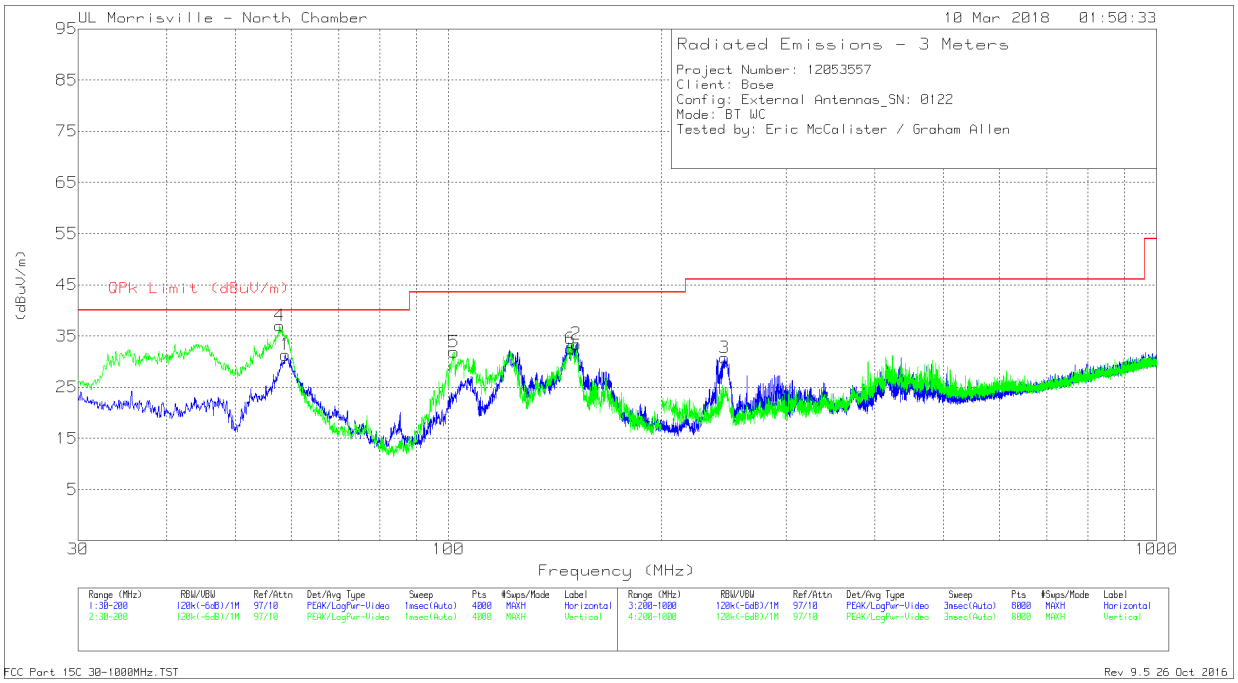
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, PCB ANT)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	122.6315	46.19	Pk	19.1	-30.7	34.59	43.52	-8.93	0-360	199	H
2	146.4801	45.74	Pk	17.9	-30.6	33.04	43.52	-10.48	0-360	199	H
3	247.1061	41.69	Pk	17.2	-29.7	29.19	46.02	-16.83	0-360	102	H
4	35.909	42.82	Pk	22.3	-31.7	33.42	40	-6.58	0-360	102	V
5	55.5298	53.37	Qp	12.6	-31.4	34.57	40	-5.43	284	106	V
6	148.3931	44.2	Pk	17.8	-30.5	31.5	43.52	-12.02	0-360	102	V

Pk - Peak detector
Qp - Quasi-Peak detector

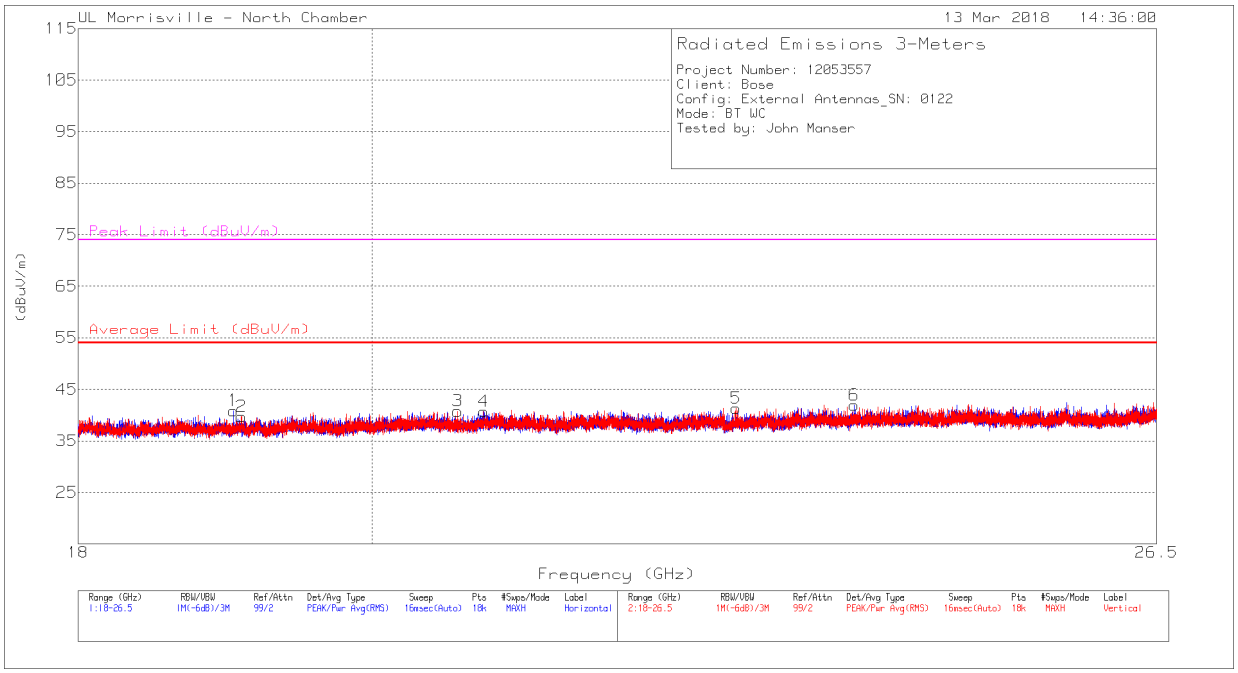
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, EXTERNAL ANT)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	57.756	51.43	Qp	12.6	-31.4	32.63	40	-7.37	263	109	V
1	58.8225	50.01	Pk	12.6	-31.3	31.31	40	-8.69	0-360	399	H
5	101.8011	47.07	Pk	15.7	-30.9	31.87	43.52	-11.65	0-360	102	V
6	148.712	45.19	Pk	17.8	-30.5	32.49	43.52	-11.03	0-360	102	V
2	151.5389	46.21	Pk	17.7	-30.5	33.41	43.52	-10.11	0-360	199	H
3	245.5059	43.35	Pk	17.2	-29.8	30.75	46.02	-15.27	0-360	102	H

Pk - Peak detector
Qp - Quasi-Peak detector

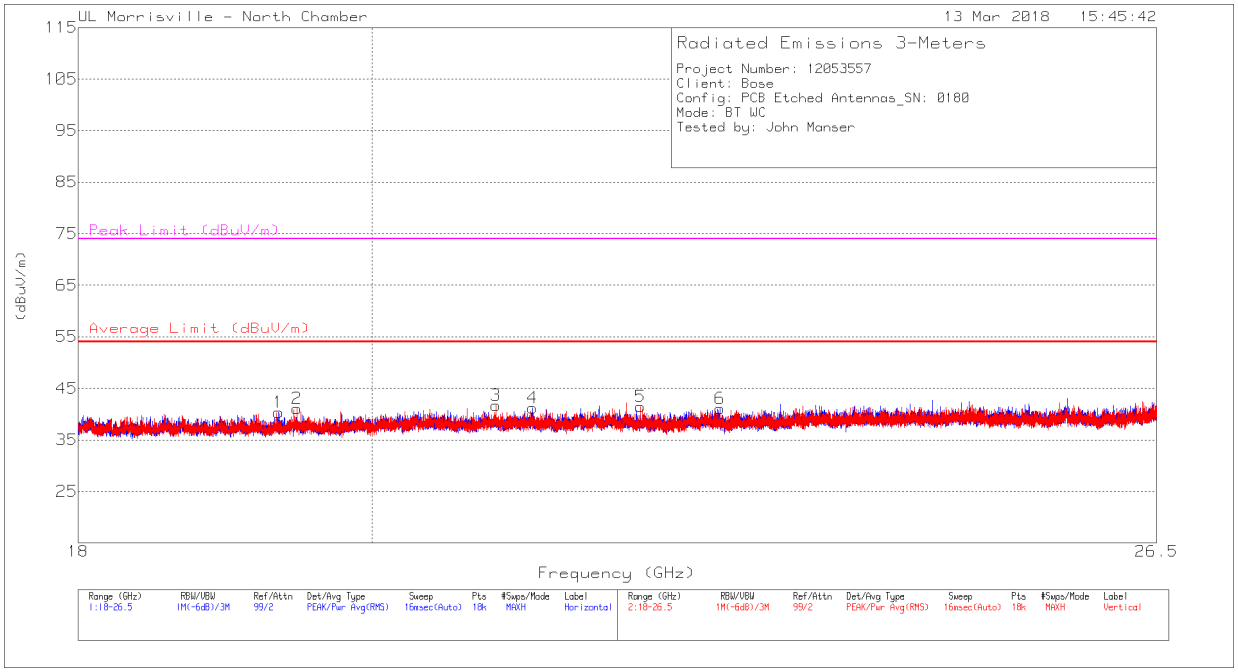
SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION, EXTERNAL ANT)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 19.031	48.29	PK-U	32.6	-40.8	40.09	-	-	74	-33.91	205	301	H
	* ** 19.031	36.89	V1TR	32.6	-40.8	28.69	54	-25.31	-	-	205	301	H
4	* ** 20.818	49.94	PK-U	33.1	-41.3	41.74	-	-	74	-32.26	251	181	H
	* ** 20.817	37.89	V1TR	33.1	-41.3	29.69	54	-24.31	-	-	251	181	H
6	* ** 23.774	49.18	PK-U	34	-40.4	42.78	-	-	74	-31.22	193	315	H
	* ** 23.775	37	V1TR	34	-40.4	30.6	54	-23.4	-	-	193	315	H
2	* ** 19.085	49.79	PK-U	32.7	-40.9	41.59	-	-	74	-32.41	240	228	V
	* ** 19.085	37.17	V1TR	32.7	-40.9	28.97	54	-25.03	-	-	240	228	V
3	* ** 20.623	49.53	PK-U	33.1	-41.3	41.33	-	-	74	-32.67	41	241	V
	* ** 20.621	37.41	V1TR	33.1	-41.3	29.21	54	-24.79	-	-	41	241	V
5	* ** 22.791	49.33	PK-U	33.8	-40.9	42.23	-	-	74	-31.77	2	333	V
	* ** 22.79	37.1	V1TR	33.8	-40.9	30	54	-24	-	-	2	333	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton, where: Ton is packet duration

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION, PCB ANT)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 19.341	48.17	PK-U	32.7	-41.1	39.77	-	-	74	-34.23	313	133	H
	* ** 19.342	37	V1TR	32.7	-41.1	28.6	54	-25.4	-	-	313	133	H
4	* ** 21.185	48.93	PK-U	33	-41.2	40.73	-	-	74	-33.27	225	182	H
	* ** 21.183	37.93	V1TR	33	-41.2	29.73	54	-24.27	-	-	225	182	H
6	* ** 22.659	48.36	PK-U	33.7	-40.9	41.16	-	-	74	-32.84	320	291	H
	* ** 22.659	37.12	V1TR	33.7	-40.9	29.92	54	-24.08	-	-	320	291	H
2	* ** 19.47	48.92	PK-U	32.8	-41.2	40.52	-	-	74	-33.48	178	390	V
	* ** 19.47	37.46	V1TR	32.8	-41.2	29.06	54	-24.94	-	-	178	390	V
3	* ** 20.911	49.33	PK-U	33.1	-41.2	41.23	-	-	74	-32.77	205	229	V
	* ** 20.909	37.81	V1TR	33.1	-41.2	29.71	54	-24.29	-	-	205	229	V
5	* ** 22.022	47.35	PK-U	33.7	-40.9	40.15	-	-	74	-33.85	56	165	V
	* ** 22.023	36.69	V1TR	33.7	-40.9	29.49	54	-24.51	-	-	56	165	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK-U: Maximum Peak
V1TR: VB=1/Ton, where: Ton is packet duration

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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.

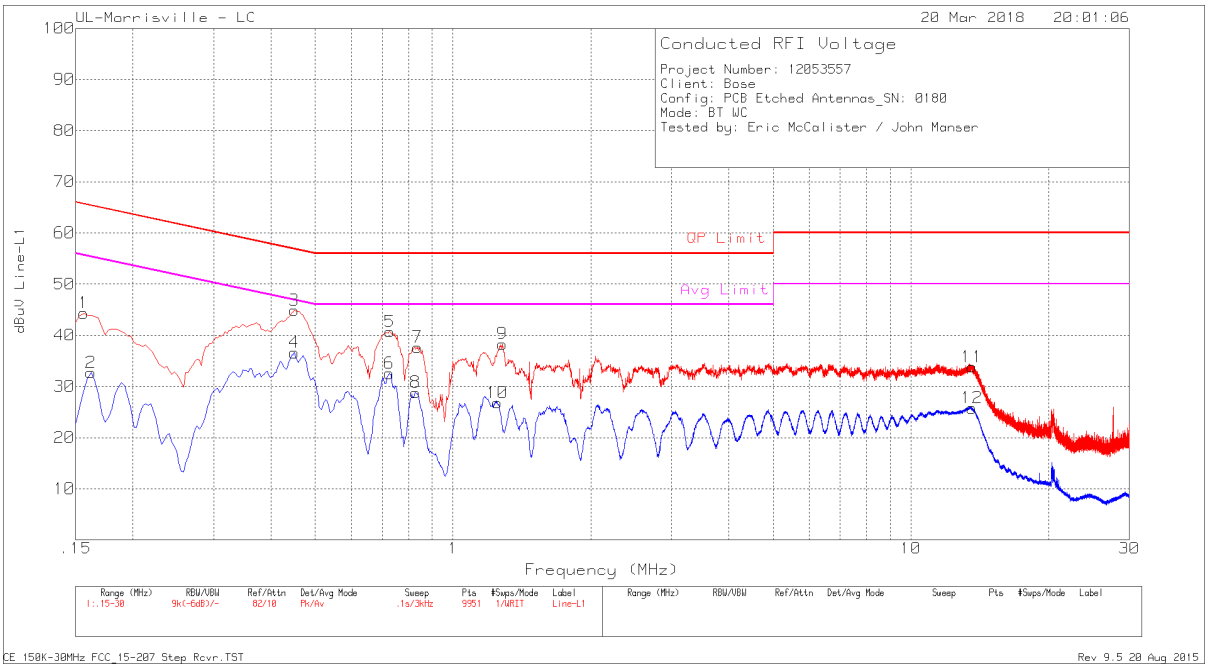
TEST PROCEDURE

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 C63.10.

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 lines.

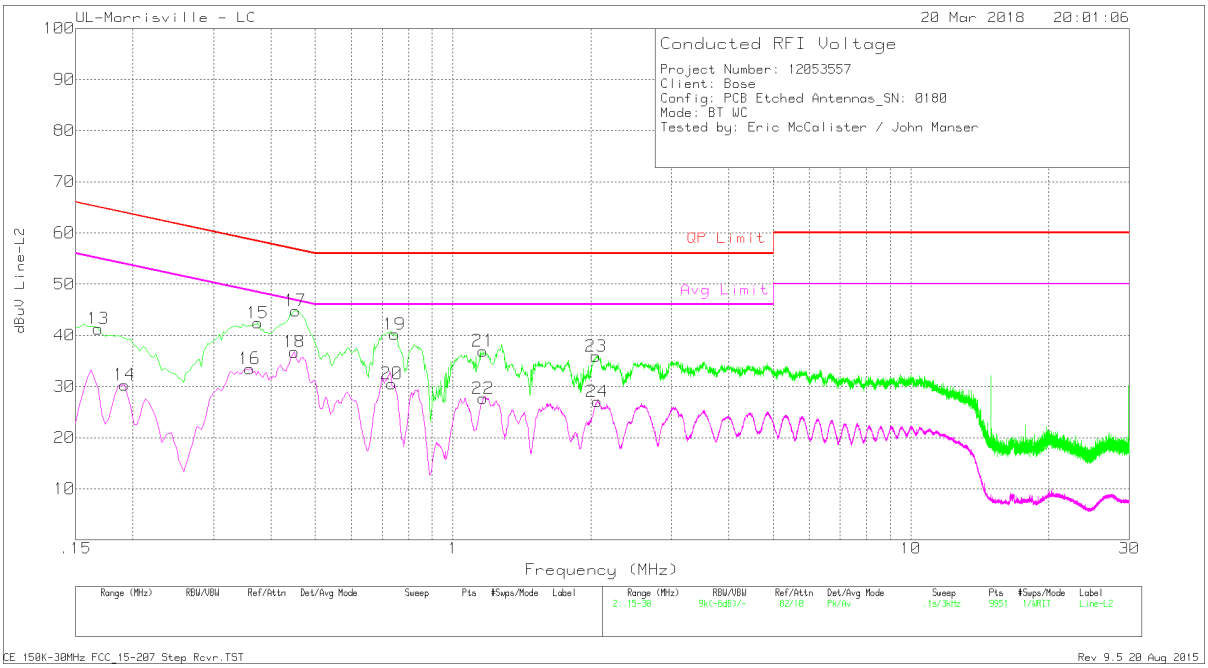
LINE 1 RESULTS – PCB ANTENNA



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
1	.156	34.14	Pk	.2	10	44.34	65.67	-21.33	-	-
2	.162	22.52	Av	.2	10	32.72	-	-	55.36	-22.64
3	.45	34.85	Pk	.1	9.9	44.85	56.88	-12.03	-	-
4	.45	26.6	Av	.1	9.9	36.6	-	-	46.88	-10.28
5	.729	30.81	Pk	0	9.9	40.71	56	-15.29	-	-
6	.726	22.65	Av	0	9.9	32.55	-	-	46	-13.45
7	.837	27.78	Pk	0	9.9	37.68	56	-18.32	-	-
8	.828	18.93	Av	0	9.9	28.83	-	-	46	-17.17
9	1.281	28.31	Pk	0	10	38.31	56	-17.69	-	-
10	1.251	16.79	Av	0	10	26.79	-	-	46	-19.21
11	13.608	23.65	Pk	.1	10.1	33.85	60	-26.15	-	-
12	13.596	15.58	Av	.1	10.1	25.78	-	-	50	-24.22

Pk - Peak detector
Av - Average detection

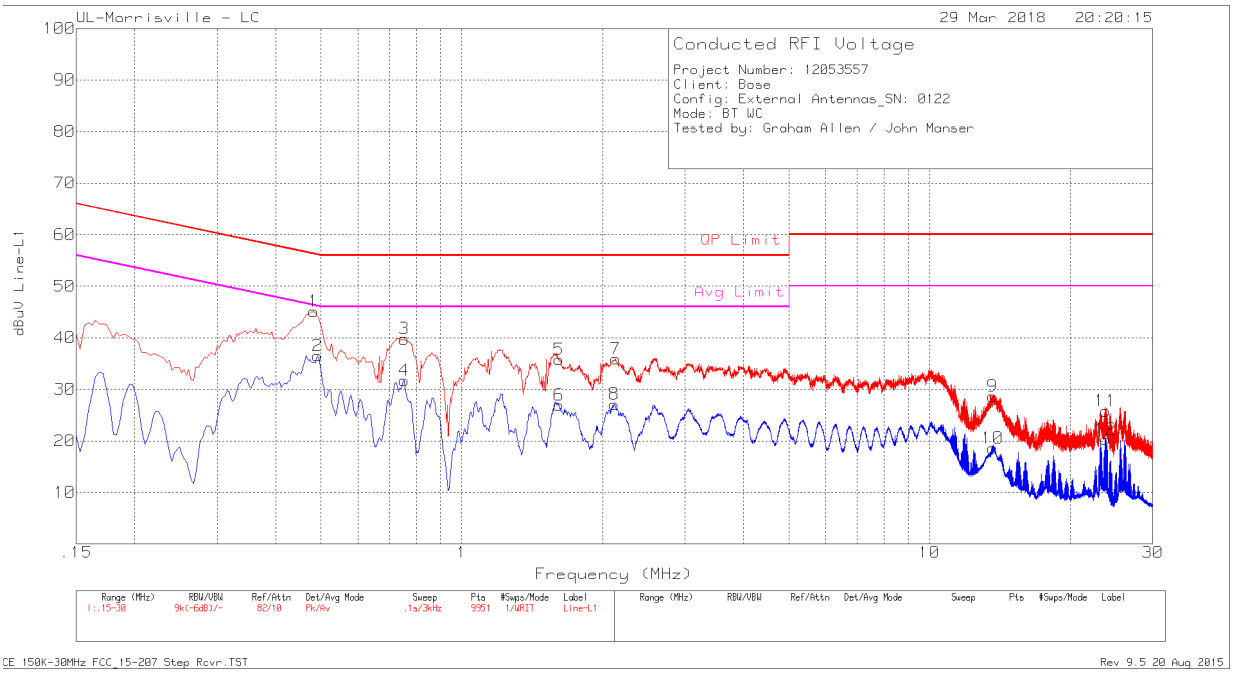
LINE 2 RESULTS – PCB ANTENNA



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
13	.168	31.07	Pk	.2	10	41.27	65.06	-23.79	-	-
14	.192	20.11	Av	.2	10	30.31	-	-	53.95	-23.64
15	.375	32.39	Pk	.1	9.9	42.39	58.39	-16	-	-
16	.36	23.49	Av	.1	9.9	33.49	-	-	48.73	-15.24
17	.453	34.8	Pk	.1	9.9	44.8	56.82	-12.02	-	-
18	.45	26.73	Av	.1	9.9	36.73	-	-	46.88	-10.15
19	.7455	30.34	Pk	0	9.9	40.24	56	-15.76	-	-
20	.735	20.65	Av	0	9.9	30.55	-	-	46	-15.45
21	1.164	27.05	Pk	0	9.9	36.95	56	-19.05	-	-
22	1.164	17.74	Av	0	9.9	27.64	-	-	46	-18.36
23	2.055	25.93	Pk	0	10	35.93	56	-20.07	-	-
24	2.064	17.03	Av	0	10	27.03	-	-	46	-18.97

Pk - Peak detector
Av - Average detection

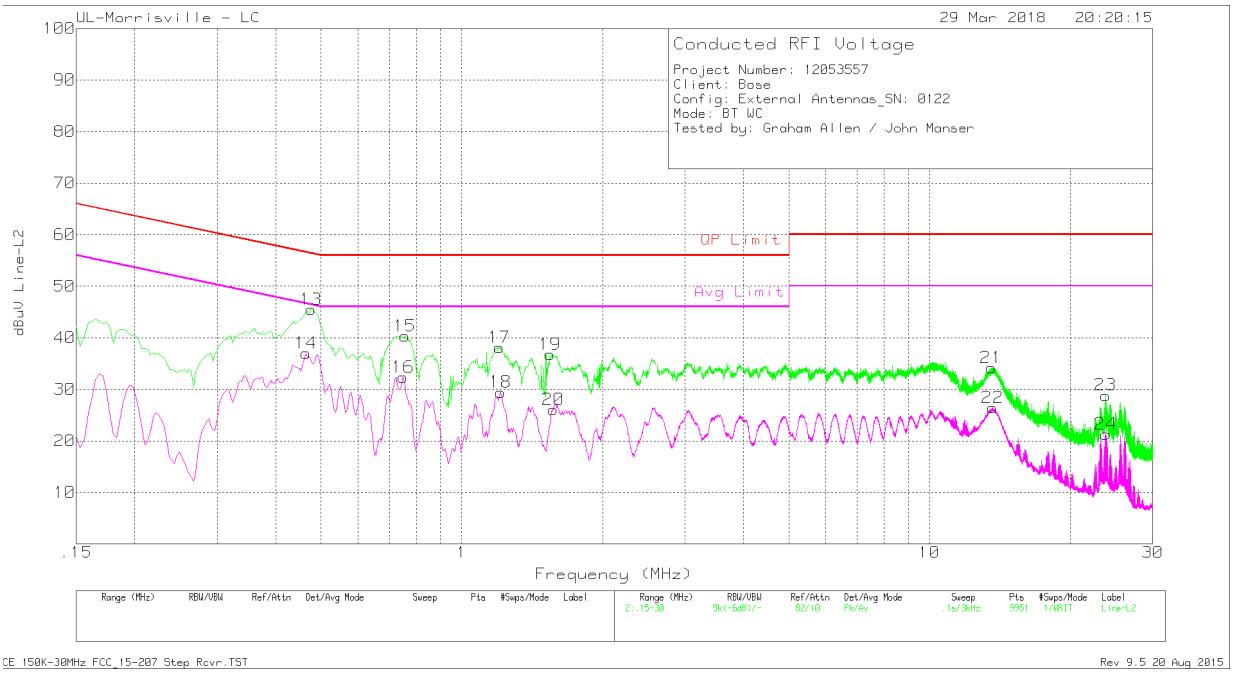
LINE 1 RESULTS – EXTERNAL ANTENNA



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
1	.483	35.19	Pk	0	9.9	45.09	56.29	-11.2	-	-
2	.492	26.65	Av	0	9.9	36.55	-	-	46.13	-9.58
3	.753	29.79	Pk	0	10	39.79	56	-16.21	-	-
4	.753	21.7	Av	0	10	31.7	-	-	46	-14.3
5	1.6155	25.76	Pk	0	10	35.76	56	-20.24	-	-
6	1.614	16.93	Av	0	10	26.93	-	-	46	-19.07
7	2.133	25.89	Pk	0	10	35.89	56	-20.11	-	-
8	2.121	17.11	Av	0	10	27.11	-	-	46	-18.89
9	13.638	18.47	Pk	.1	10.1	28.67	60	-31.33	-	-
10	13.65	8.37	Av	.1	10.1	18.57	-	-	50	-31.43
11	23.784	15.39	Pk	.2	10.2	25.79	60	-34.21	-	-
12	23.784	9.92	Av	.2	10.2	20.32	-	-	50	-29.68

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS – EXTERNAL ANTENNA



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
13	.477	35.52	Pk	.1	9.9	45.52	56.39	-10.87	-	-
14	.465	26.98	Av	.1	9.9	36.98	-	-	46.6	-9.62
15	.756	30.4	Pk	0	9.9	40.3	56	-15.7	-	-
16	.75	22.32	Av	0	10	32.32	-	-	46	-13.68
17	1.203	28.14	Pk	0	10	38.14	56	-17.86	-	-
18	1.212	19.44	Av	0	10	29.44	-	-	46	-16.56
19	1.545	26.79	Pk	0	10	36.79	56	-19.21	-	-
20	1.569	16.05	Av	0	10	26.05	-	-	46	-19.95
21	13.569	23.97	Pk	.1	10.1	34.17	60	-25.83	-	-
22	13.65	16.23	Av	.1	10.1	26.43	-	-	50	-23.57
23	23.784	18.45	Pk	.2	10.2	28.85	60	-31.15	-	-
24	23.823	10.92	Av	.2	10.2	21.32	-	-	50	-28.68

Pk - Peak detector
Av - Average detection