FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC

FCC ID: PY7-PM0944

REPORT NUMBER: R11139405A-E6V2

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Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	4/20/2016	Initial issue	C. OOI
V2	4/25/2016	Updated Output Power, Device Serial Numbers and Section 6.	C. OOI

TABLE OF CONTENTS

UL LLC.
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONY MOBILE COMMUNICATIONS, INC.

EUT DESCRIPTION: GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC

SERIAL NUMBER: Z0ZW, CB5129YMBE, CB5129YM7A

DATE TESTED: APRIL 18 - 20, 2016

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

UL LLC reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL LLC shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL LLC issued reports. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

This report may contain test results that are not covered by the NVLAP or A2LA accreditation. The scope of accreditation is limited to the specific tests that are listed on the NVLAP and/or A2LA websites referenced at the end of this report.

Approved & Released For
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC and ANSI C63.10-2013, FCC CFR 47 Part 2, and FCC CFR 47 Part 15.

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 Suite B, Perimeter Park Drive, Morrisville, NC 27560.

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

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

The onsite chambers are covered under Industry Canada company address code 2180C with site numbers 2180C -1 through 2180C-4, respectively.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at http://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
Total RF power, conducted	+/-	0.45
RF power density, conducted	+/-	1.50
Spurious emissions, conducted	+/-	2.94
All emissions, radiated up to 26 GHz	+/-	5.36
Temperature	+/-	0.07
Humidity	+/-	2.26
DC and low frequency voltages	+/-	1.27
Conducted Disturbance, 0.15 to 30 MHz	+/-	2.37

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

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC

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	10.31	10.74
2402 - 2480	Enhanced 8PSK	8.88	7.73

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode of showing compliance. For average power data, please refer to section 8.7.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes integrated antenna, with a maximum as below:

Frequency (MHz)	Antenna Gain (dBi)
2.402	-7.0
2.441	-6.2
2.480	-6.9

5.4. SOFTWARE AND FIRMWARE

The firmware/SW installed in the EUT during testing was SONY, s_atp_xxxx_1_600_7_9

The hardware version was A

The test utility software used during testing was Tera Term, rev 4.8.3(SVN#5602)

5.5. WORST-CASE CONFIGURATION AND MODE

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

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

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	SONY	UCH 20 1295-70821	N/A	N/A
Earphone	SONY	MH410C	N/A	N/A
Laptop	Lenovo	T450	PC-0A2UQU	N/A
Laptop AC Adapter	Lenovo	ADLX65NLC2A	11S45N0263Z1ZS995256HR	N/A

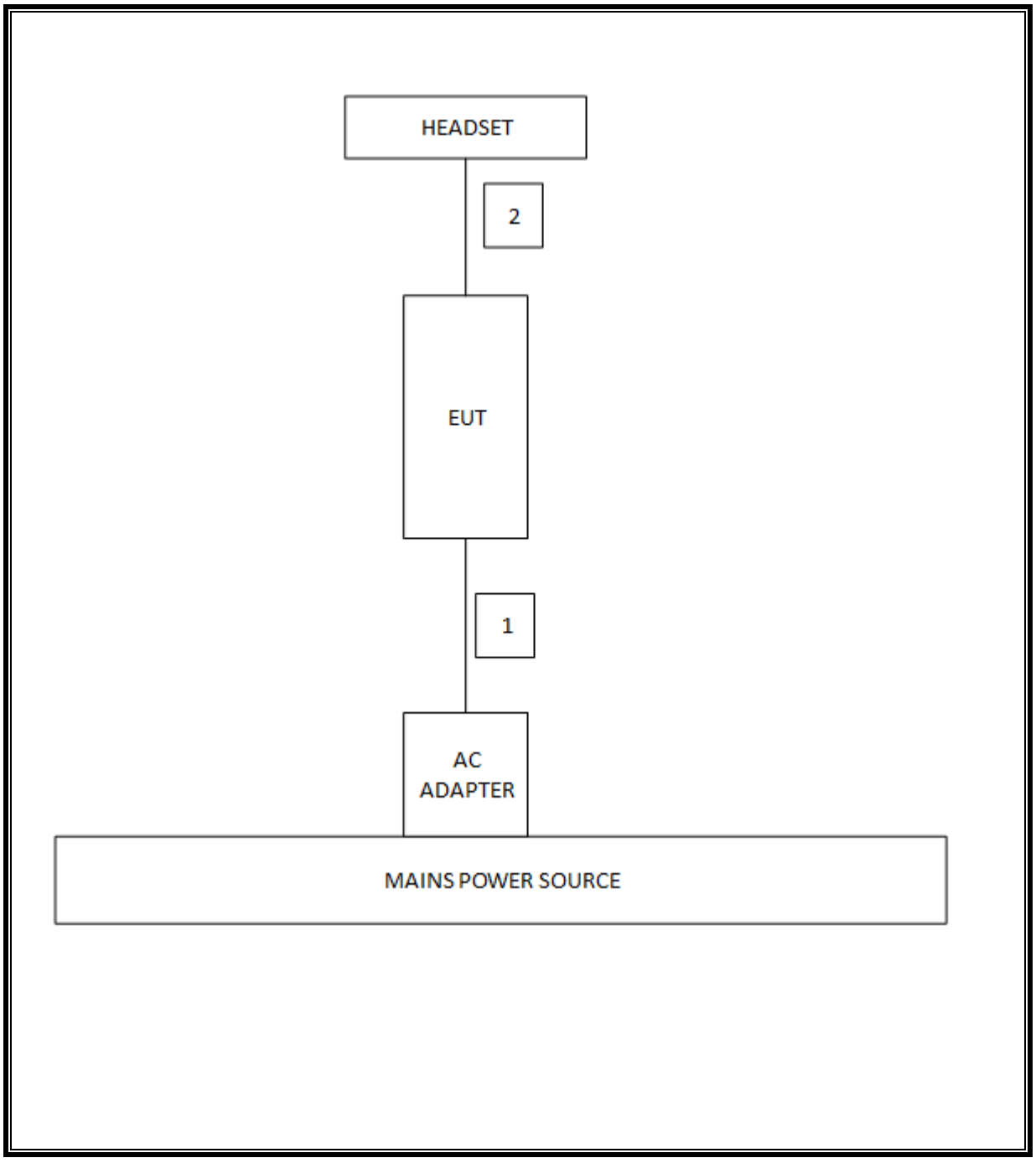
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	Mini-USB	Shielded	1m	N/A
2	Audio	1	Mini-Jack	Unshielded	1.5m	N/A

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz	**(Loop Ant.)**			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2015-12-08	2016-12-31
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2015-06-10	2016-06-30
	1-18 GHz				
AT0067 (02/28-03/17/2016)	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2015-03-12	2016-03-31
AT0069 (As of 03/18/2016)	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2016-03-07	2017-03-31
	18-40 GHz				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2015-08-27	2016-08-31
AT0077	Horn Antenna, 26-40GHz	ARA	MWH-2640/B	2015-08-27	2016-08-31
	Tuned Dipole Set				
AT0013-AT0016	Four Dipole Antenna Set, 30 to 1000 MHz	EMCO	3121C-DB-1, -2, -3, -4	2015-05-06	2016-05-31
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2015-10-07	2016-10-31
S-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2015-06-09	2016-06-30
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2015-08-22	2016-08-31
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2016-02-29	2017-02-28
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2016-03-17	2017-03-31
SA0026 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2016-02-24	2017-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
HI0050	Temp/Humid/Pressure Meter	Cole-Parmer	99760-00	2015-07-01	2016-07-31

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 1				
SA0019	Spectrum Analyzer	Agilent Technologies	E4446A	2015-09-02	2016-09-30
PWM004	RF Power Meter	Keysight Technologies	N1911A	2015-06-08	2016-06-08
PWS004	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2015-06-05	2016-06-05
HI0079	Temp/Humid/Pressure Meter	Springfield	PreciseTemp	2015-07-1	2016-07-31
MM0167	True RMS Multimeter	Agilent	U1232A	2015-08-17	2016-08-31
76022	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	NA	NA
T1023	EMPower USB RF Power Sensor, 10MHz to 6GHz	ETS Lindgren	7002-006	2015-10-01	2016-10-01

Test Software List			
Description	**Manufacturer**	**Model**	**Version**
Radiated Software	UL	UL EMC	Ver 9.5, Aug 20, 2015
Conducted Software	UL	UL EMC	Ver 9.5, Aug 20, 2015
Antenna Port Software	UL	UL RF	Ver 4.3, Mar 16, 2016

7. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result
2.1049	RSS-GEN 6.6	Occupied Bandwidth (99%)	N/A	Conducted	Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247 (b)(1)	RSS-247 5.4.2	TX conducted output power	<21dBm		Pass
15.247 (a)(1)	RSS-247 5.1.2	Hopping frequency separation	> 25KHz		Pass
15.247 (a)(1)(iii)	RSS-247 5.1.4	Number of Hopping Channels	More than 15 non-overlapping channels		Pass
15.247 (a)(1)(iii)	RSS-247 5.1.4	Avg Time of Occupancy	< 0.4sec		Pass
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	Pass
15.205, 15.209, 15.247(d)	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m		Pass

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME, DUTY CYCLE

LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

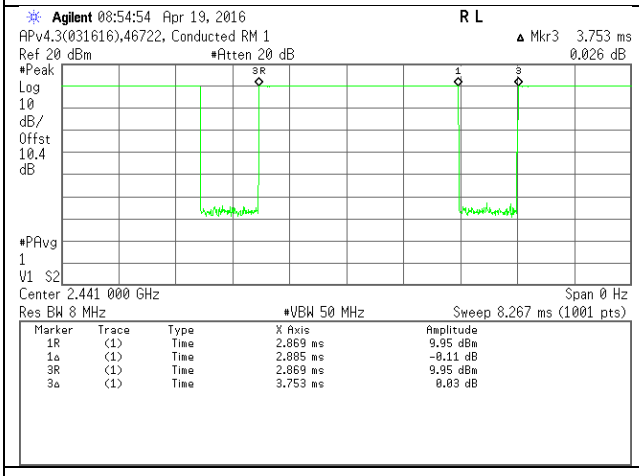
RESULTS

ON TIME AND DUTY CYCLE RESULTS

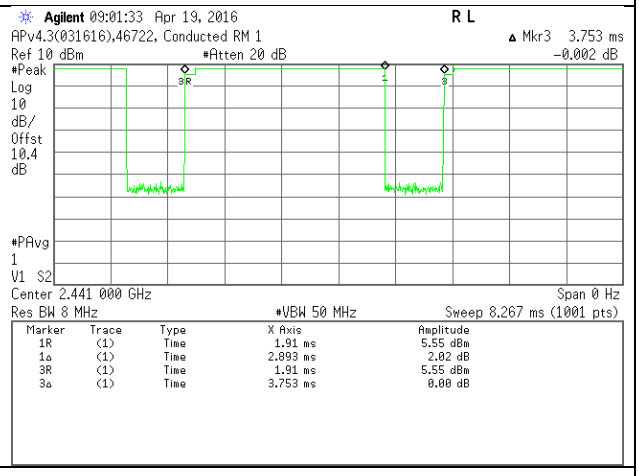
Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
GFSK	2.885	3.753	0.769	76.87%	1.14	0.347
8PSK	2.893	3.753	0.771	77.08%	1.13	0.346

DUTY CYCLE PLOTS

GFSK



8PSK



NOTE: --

8.2. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

DA 00-705: 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.

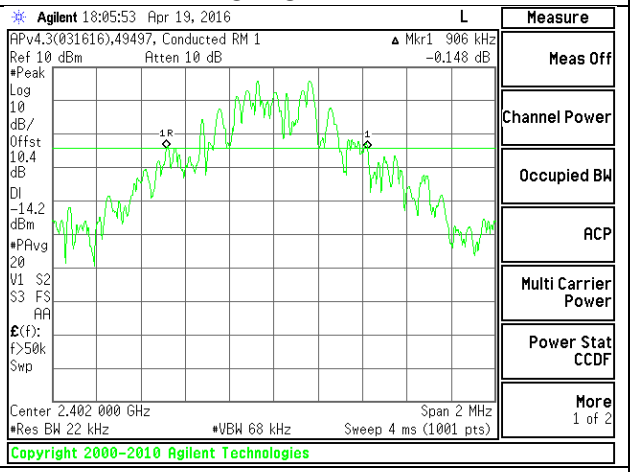
RESULTS

8.2.1. **GFSK 20 dB BANDWIDTH PLOTS AND TABLE**

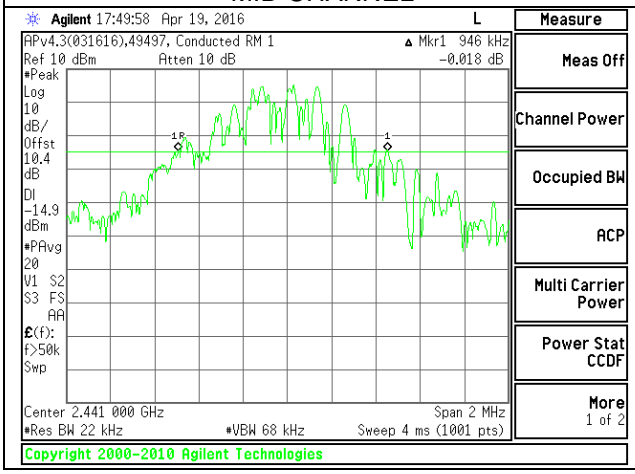
TEST RESULT TABLE

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	0.906
Middle	2441	0.946
High	2480	0.910

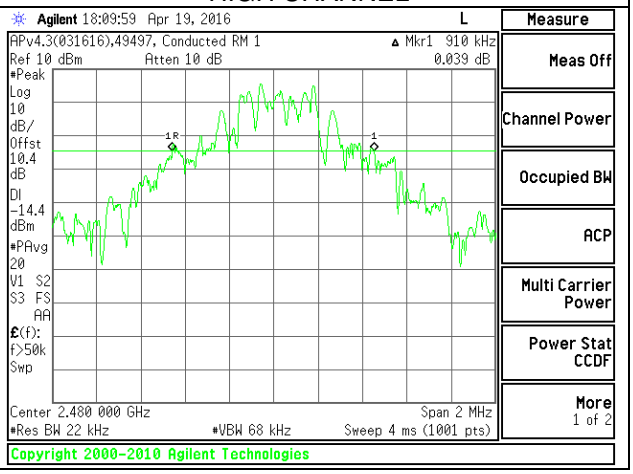
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

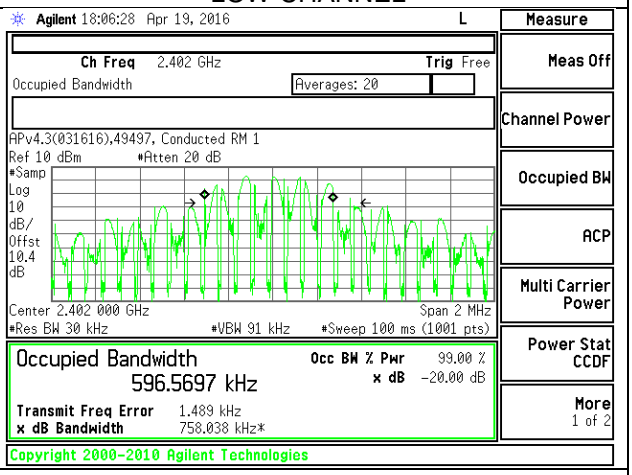


8.2.2. **GFSK 99% BANDWIDTH PLOTS AND TABLE**

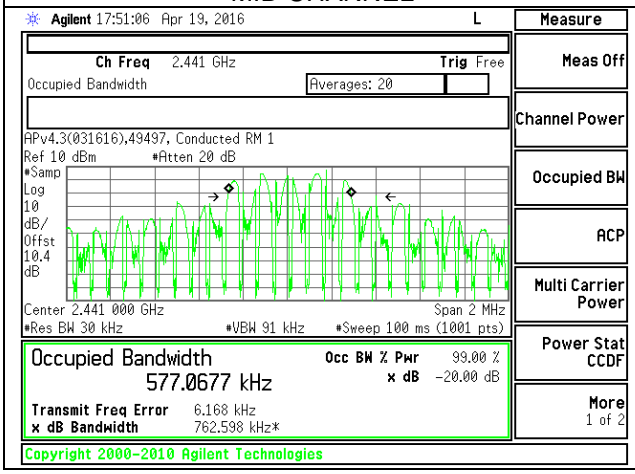
TEST RESULT TABLE

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	0.597
Middle	2441	0.577
High	2480	0.585

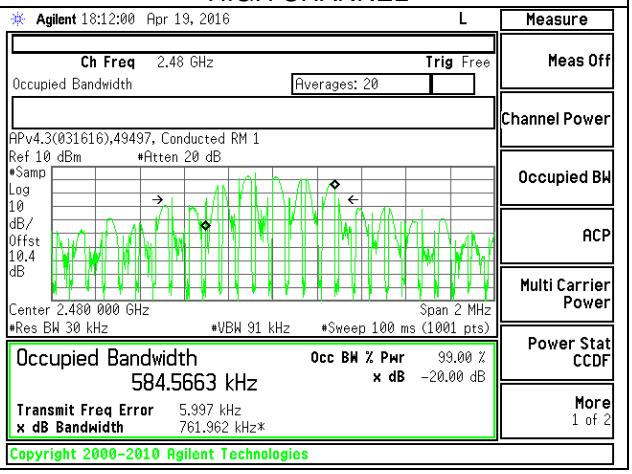
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

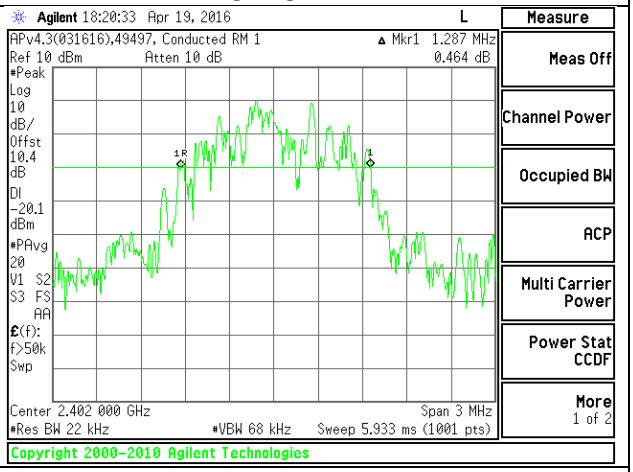


8.2.3. **8PSK 20 dB BANDWIDTH PLOTS AND TABLE**

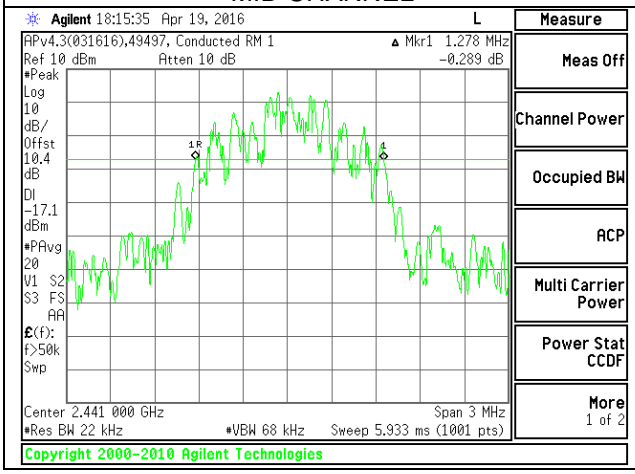
TEST RESULT TABLE

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	1.287
Middle	2441	1.278
High	2480	1.275

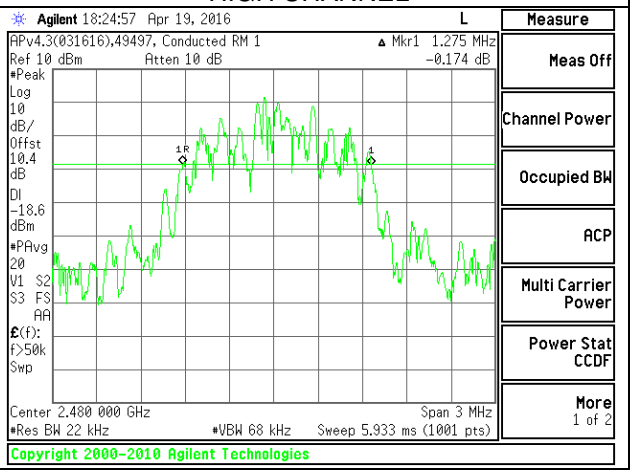
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

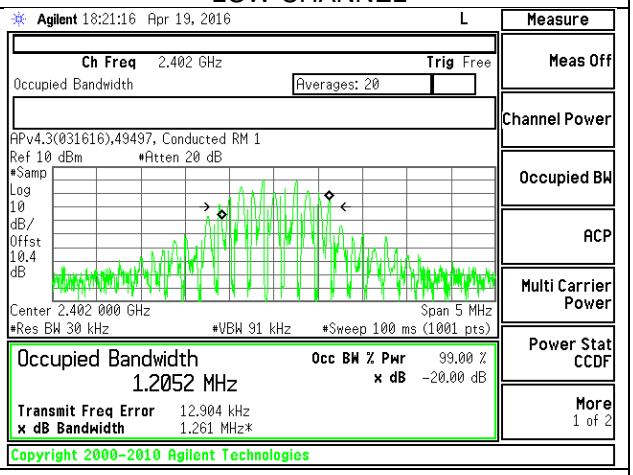


8.2.4. **8PSK 99% BANDWIDTH PLOTS AND TABLE**

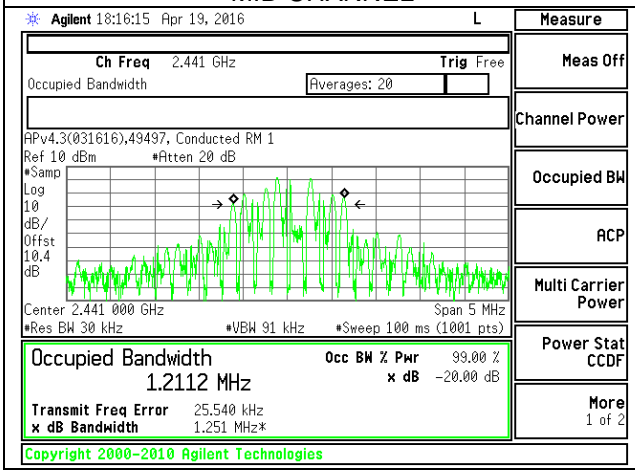
TEST RESULT TABLE

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.205
Middle	2441	1.211
High	2480	1.206

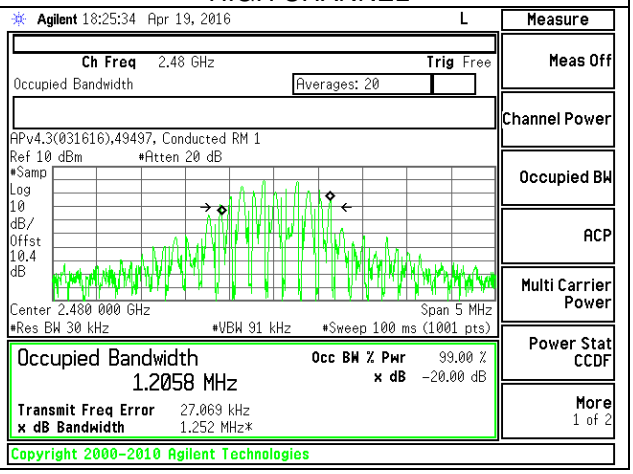
LOW CHANNEL



MID CHANNEL



HIGH CHANNEL



8.3. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

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

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

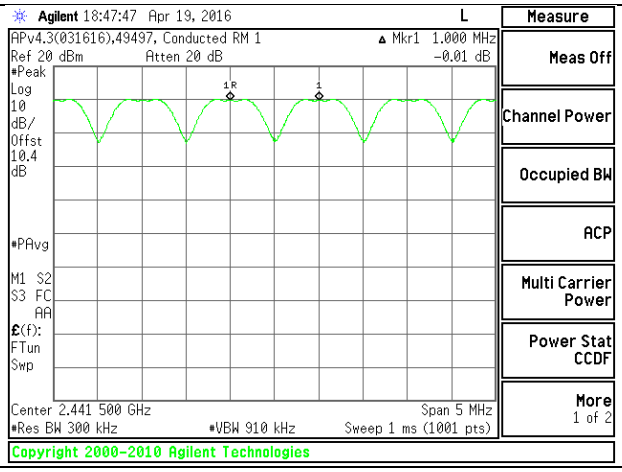
TEST PROCEDURE

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

RESULTS

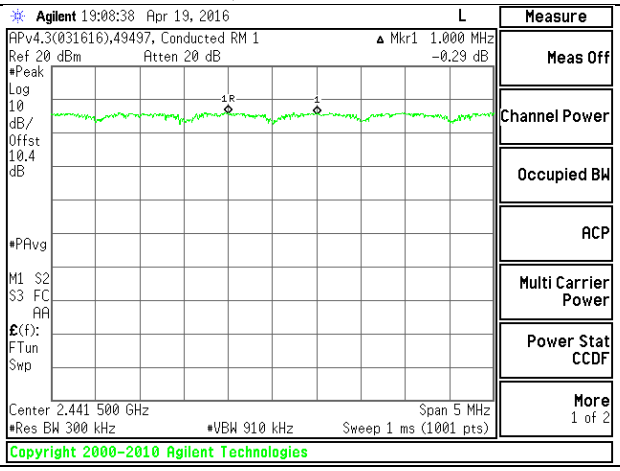
8.3.1. BASIC DATA RATE GFSK MODULATION

HOPPING FREQUENCY SEPARATION PLOT



NOTE: Hopping Frequency Separation is 1 MHz

8.3.1. ENHANCED DATA RATE 8PSK MODULATION

HOPPING FREQUENCY SEPARATION PLOT

NOTE: Hopping Frequency Separation is 1 MHz

8.4. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

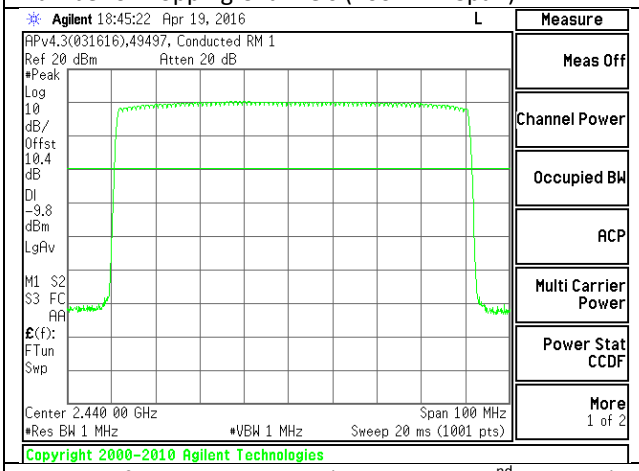
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

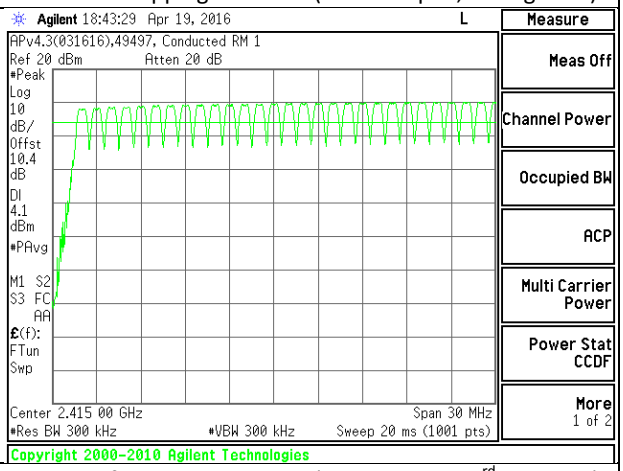
Normal Mode: 79 Channels observed.

8.4.1. **NUMBER OF HOPPING CHANNELS PLOTS**

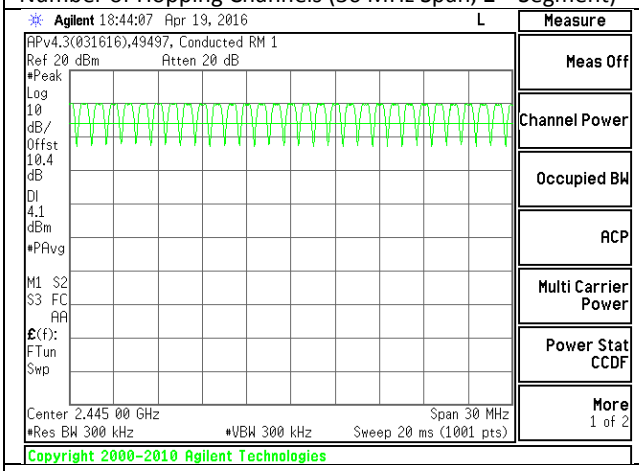
Number of Hopping Channels (100 MHz Span)



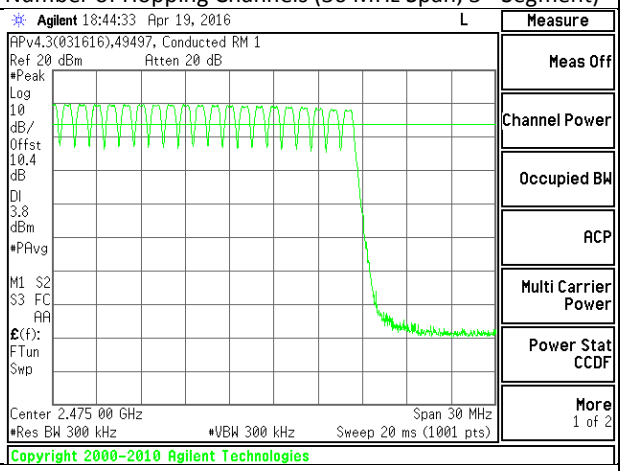
Number of Hopping Channels (30 MHz Span, 1st Segment)



Number of Hopping Channels (30 MHz Span, 2nd Segment)



Number of Hopping Channels (30 MHz Span, 3rd Segment)



NOTE: --

8.5. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

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 numNumber ober 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.

RESULTS

8.5.1. BASIC DATA RATE GFSK MODULATION

AVERAGE TIME OF OCCUPANCY

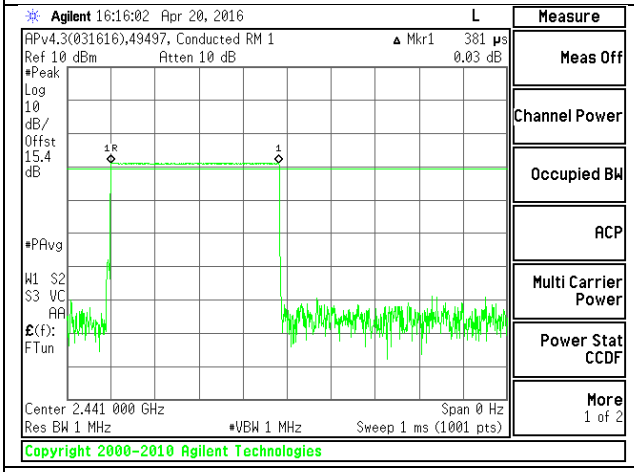
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.381	32	0.1219	0.4	-0.2781
DH3	1.638	15	0.2457	0.4	-0.1543
DH5	2.884	11	0.3172	0.4	-0.0828

DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.381	8	0.03048	0.4	-0.3695
DH3	1.638	3.75	0.06143	0.4	-0.3386
DH5	2.884	2.75	0.07931	0.4	-0.3207

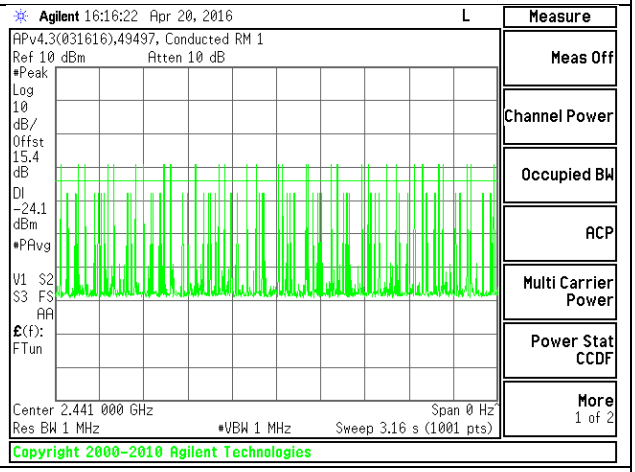
NOTE: --

Pulse Width and Number of Pulses in 3.16 Seconds Period Plots

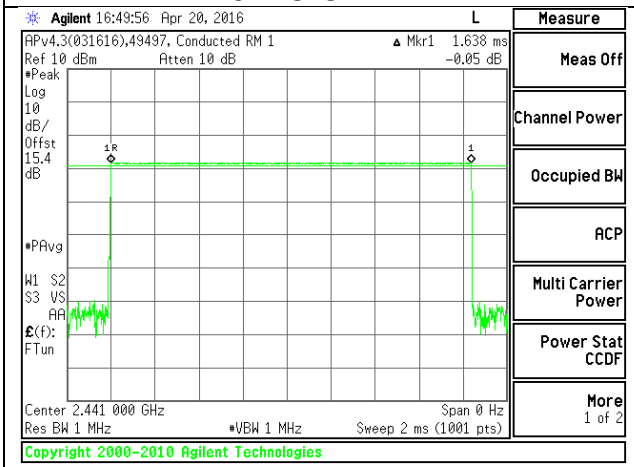
DH1 - PULSE WIDTH



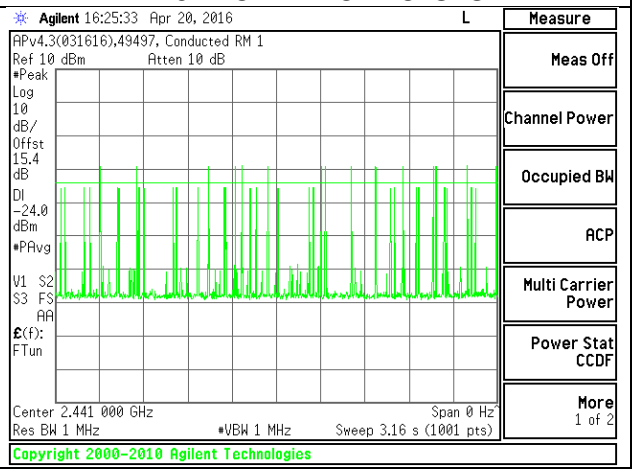
DH1 - NUMBER OF PULSES



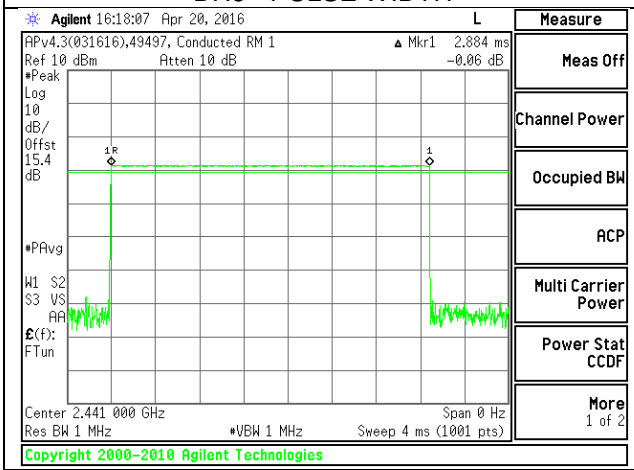
DH3 - PULSE WIDTH



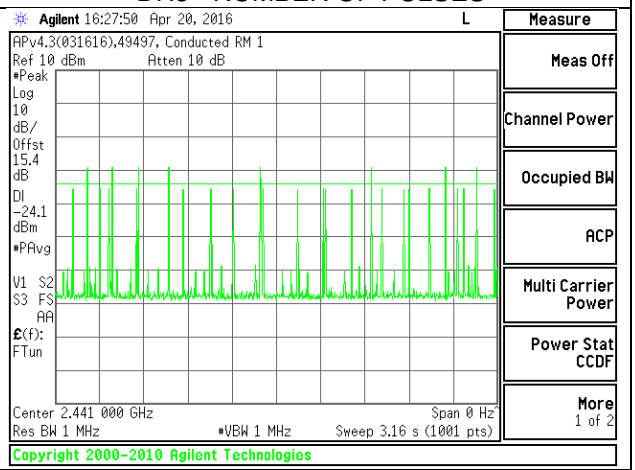
DH3 - NUMBER OF PULSES



DH5 - PULSE WIDTH



DH5 - NUMBER OF PULSES



NOTE: --

8.5.2. ENHANCED DATA RATE 8PSK MODULATION

AVERAGE TIME OF OCCUPANCY

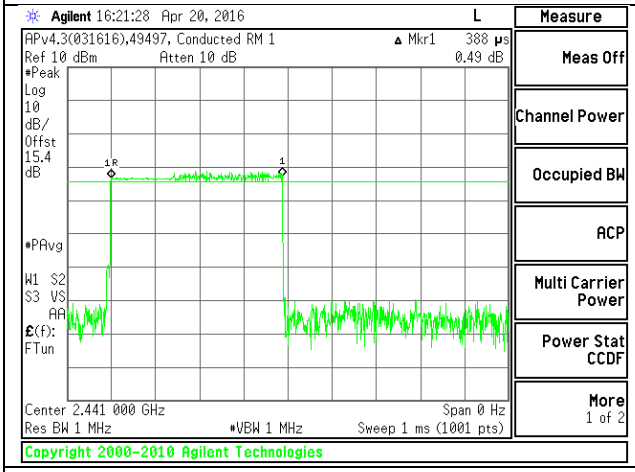
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
DH1	0.388	31	0.1203	0.4	-0.2797
DH3	1.636	15	0.2454	0.4	-0.1546
DH5	2.892	8	0.2314	0.4	-0.1686

DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK AFH Mode					
DH1	0.388	7.75	0.03007	0.4	-0.3699
DH3	1.636	3.75	0.06135	0.4	-0.3387
DH5	2.892	2	0.05784	0.4	-0.3422

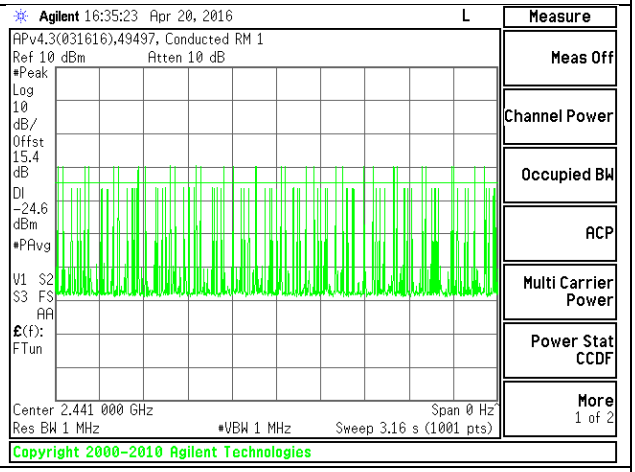
NOTE: --

Pulse Width and Number of Pulses in 3.16 Seconds Period Plots

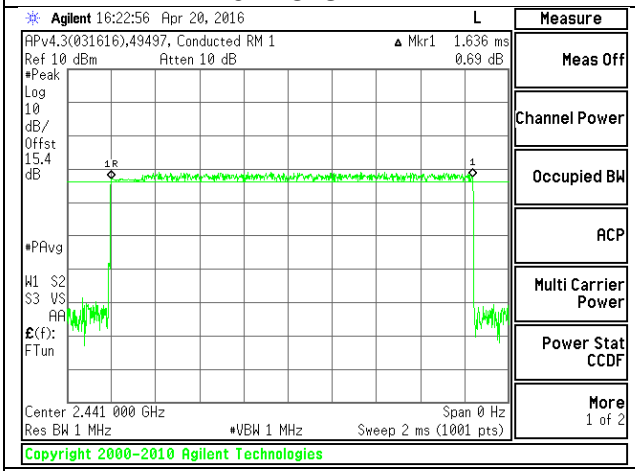
DH1 - PULSE WIDTH



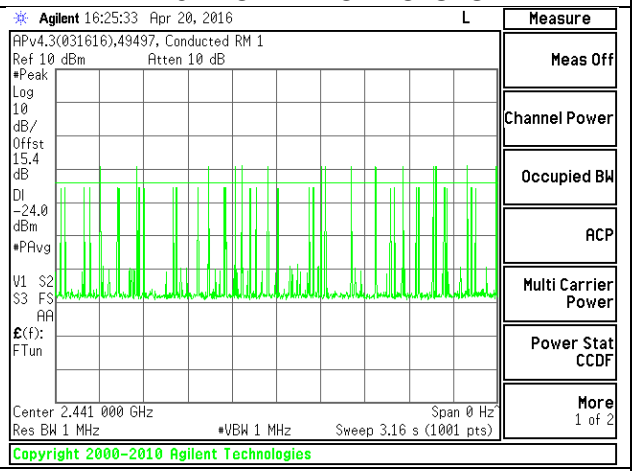
DH1 - NUMBER OF PULSES



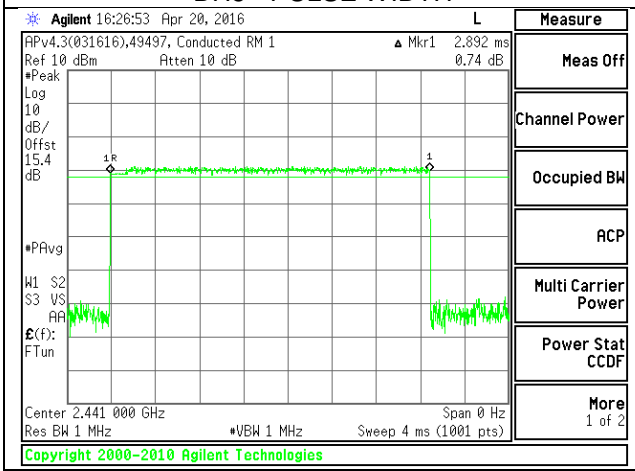
DH3 - PULSE WIDTH



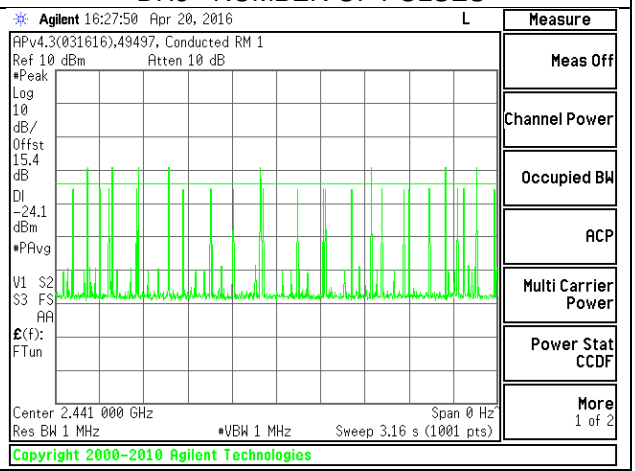
DH3 - NUMBER OF PULSES



DH5 - PULSE WIDTH



DH5 - NUMBER OF PULSES



NOTE: --

8.6. OUTPUT POWER

LIMIT

§15.247 (b) (1)

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

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a power meter with peak detector using gated method.

RESULTS

BASIC DATA RATE GFSK

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.430	21	-12.57
Middle	2441	10.310	21	-10.69
High	2480	8.890	21	-12.11

ENHANCED DATA RATE 8DPSK

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.170	21	-13.83
Middle	2441	8.880	21	-12.12
High	2480	7.440	21	-13.56

NOTE: --

8.7. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

BASIC DATA RATE GFSK

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.340
Middle	2441	10.230
High	2480	8.800

ENHANCED DATA RATE 8DPSK

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	4.620
Middle	2441	6.330
High	2480	4.900

NOTE: --

8.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

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

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

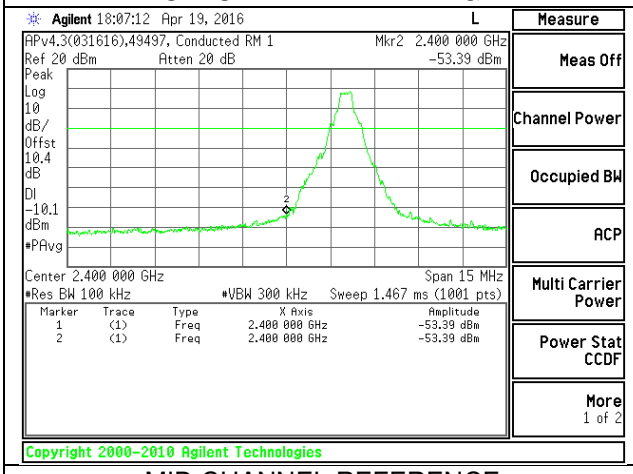
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

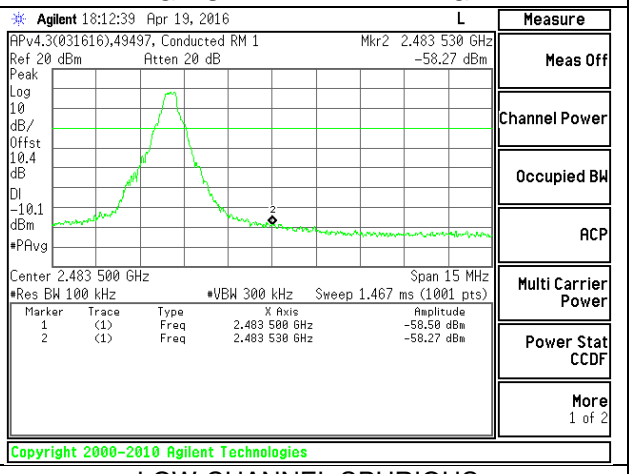
8.8.1. BASIC DATA RATE GFSK MODULATION NON-HOPPING MODE

BANDEDGE AND SPURIOUS EMISSIONS PLOTS

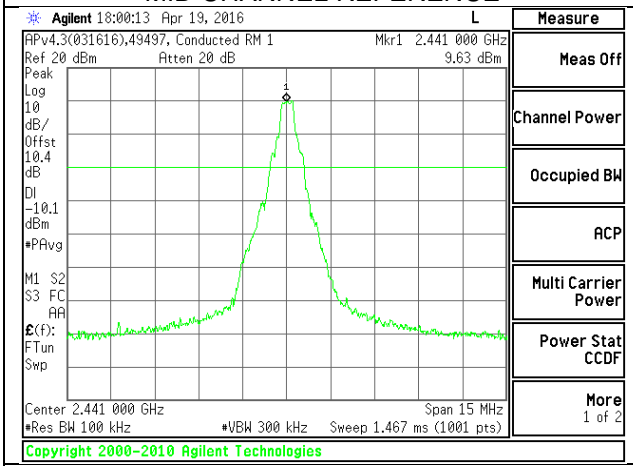
LOW CHANNEL BANDEDGE



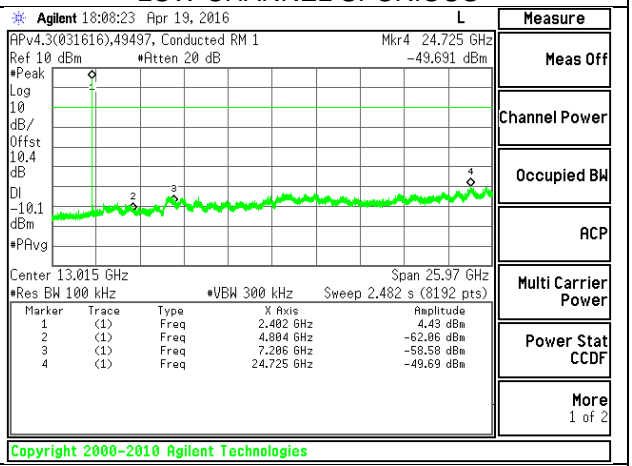
HIGH CHANNEL BANDEDGE



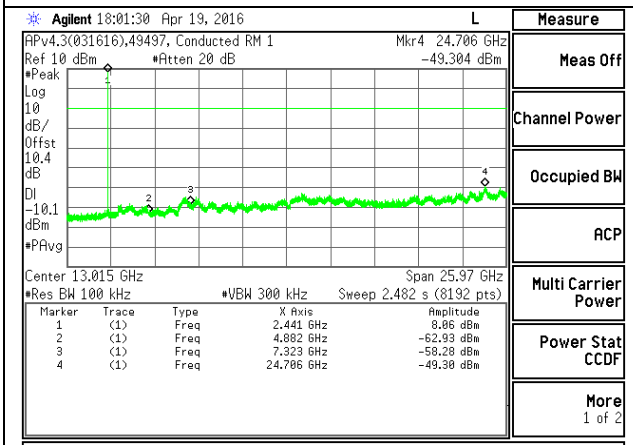
MID CHANNEL REFERENCE



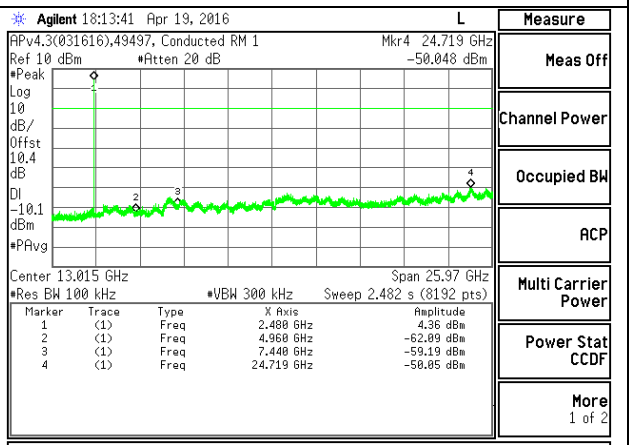
LOW CHANNEL SPURIOUS



MID CHANNEL SPURIOUS



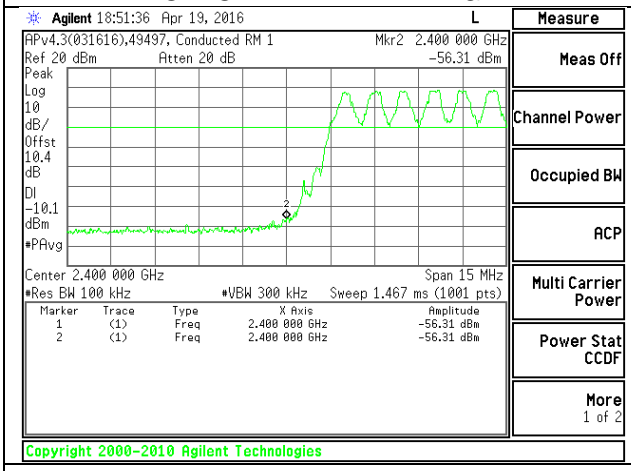
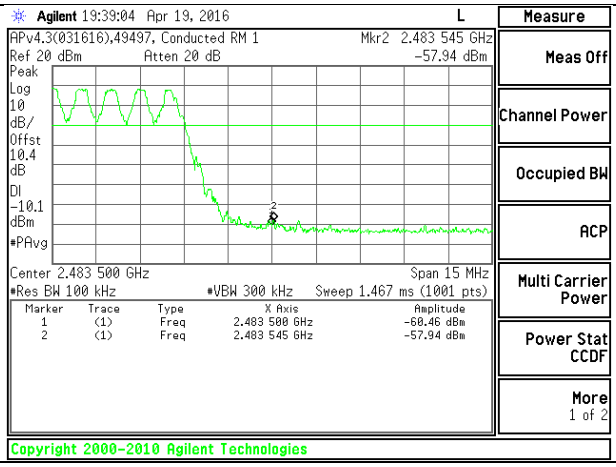
HIGH CHANNEL SPURIOUS



NOTE: Each channel was verified, and it appears that middle channel is worst and was selected as the reference limit for all channels.

8.8.2. **BASIC DATA RATE GFSK MODULATION HOPPING MODE**

SPURIOUS BANDEDGE EMISSIONS PLOTS

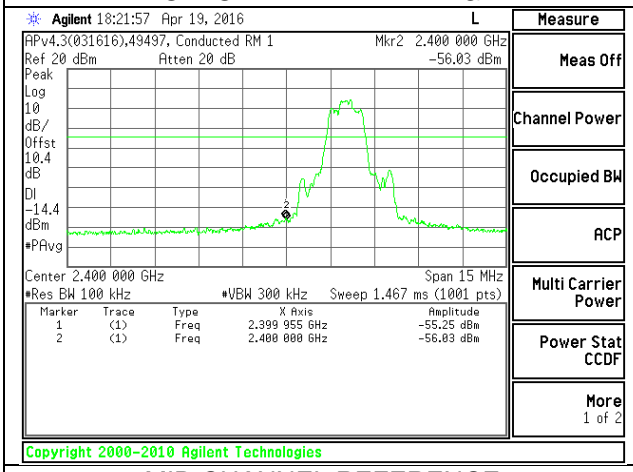
LOW CHANNEL BANDEDGE	HIGH CHANNEL BANDEDGE
	

NOTE:--

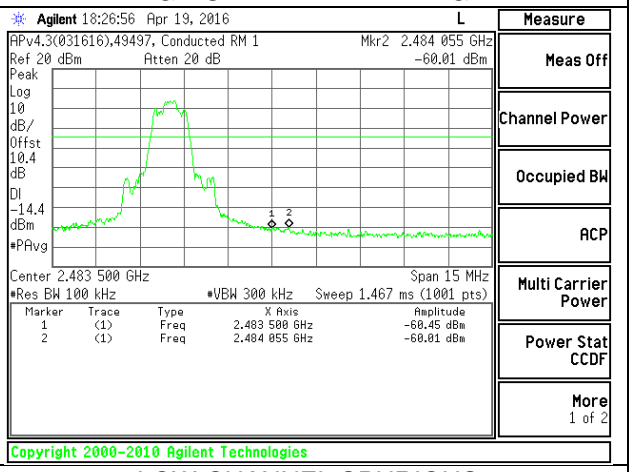
8.8.3. ENHANCED DATA RATE 8PSK MODULATION NON-HOPPING MODE

BANDEDGE AND SPURIOUS EMISSIONS PLOTS

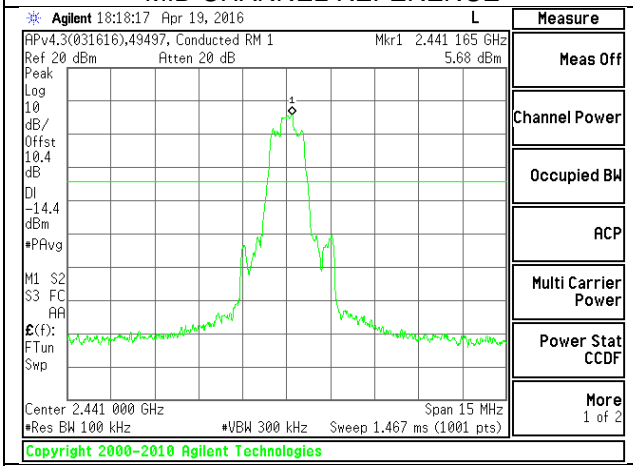
LOW CHANNEL BANDEDGE



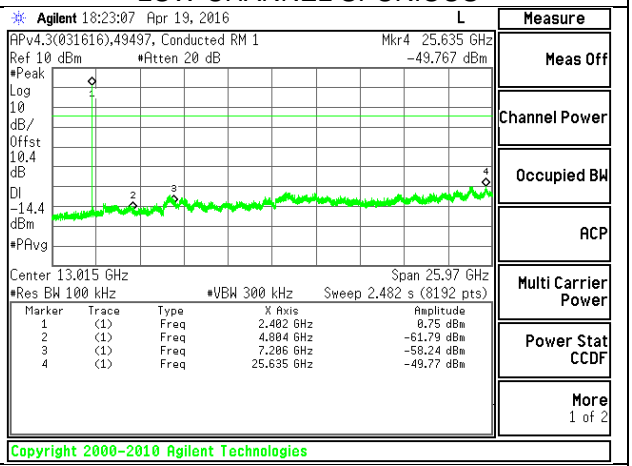
HIGH CHANNEL BANDEDGE



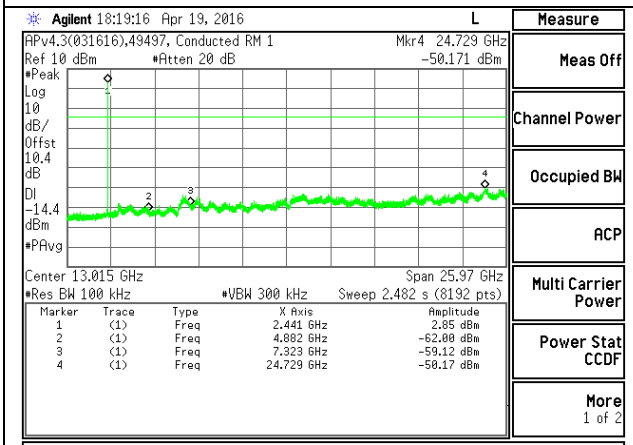
MID CHANNEL REFERENCE



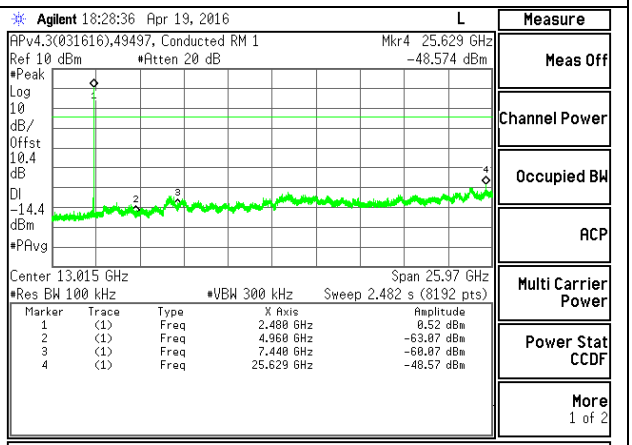
LOW CHANNEL SPURIOUS



MID CHANNEL SPURIOUS



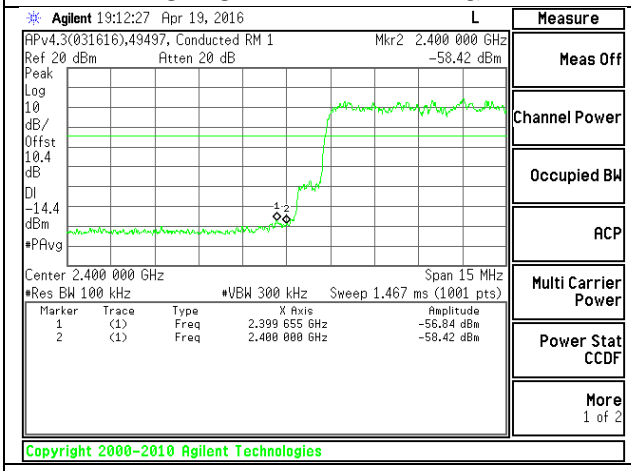
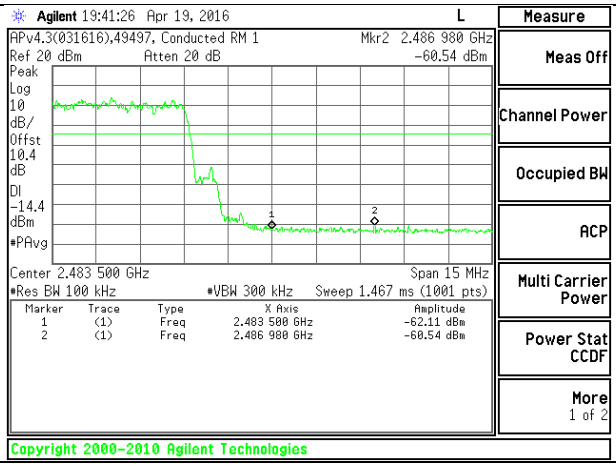
HIGH CHANNEL SPURIOUS



NOTE: Each channel was verified, and it appears that middle channel is worst and was selected as the reference limit for all channels.

8.8.4. **ENHANCED DATA RATE 8PSK MODULATION HOPPING MODE**

SPURIOUS BANDEDGE EMISSIONS PLOTS

LOW CHANNEL BANDEDGE	HIGH CHANNEL BANDEDGE
	

NOTE:--

9. RADIATED EMISSION TEST

LIMITS

FCC §15.205 and §15.209

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

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

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

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 1/T (on time) for average measurement.

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

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

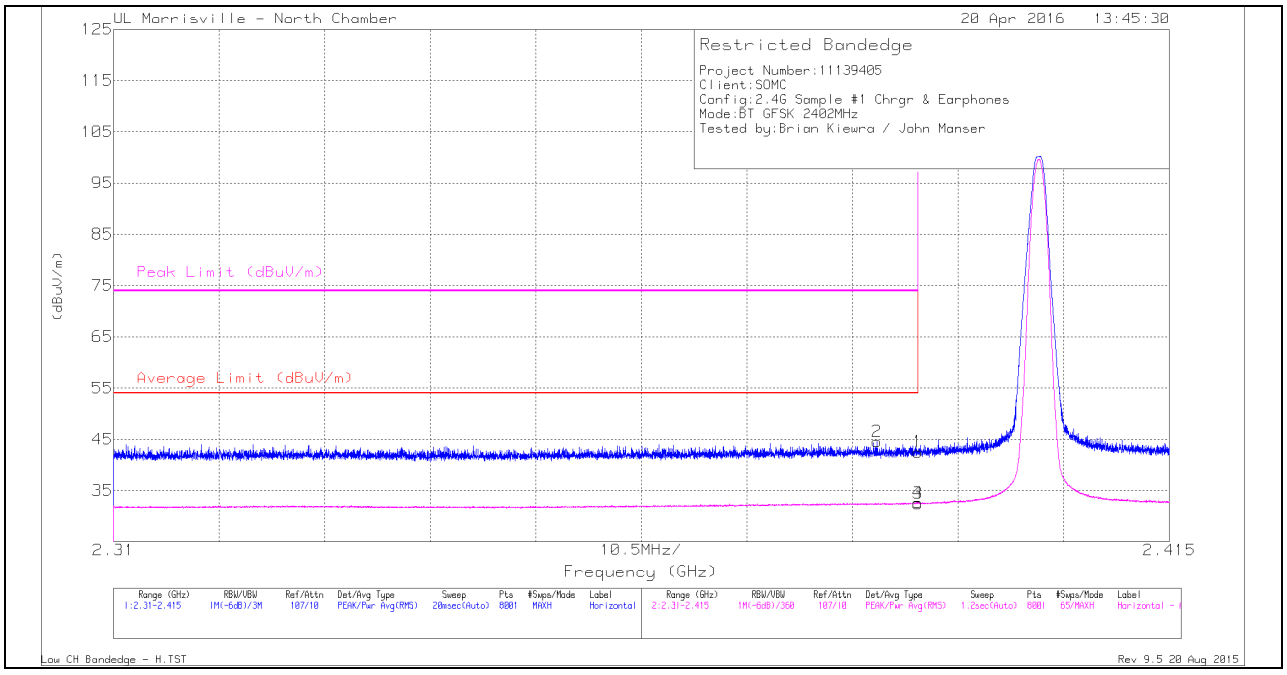
RESULTS

9.1. TRANSMITTER ABOVE 1 GHz

9.1.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

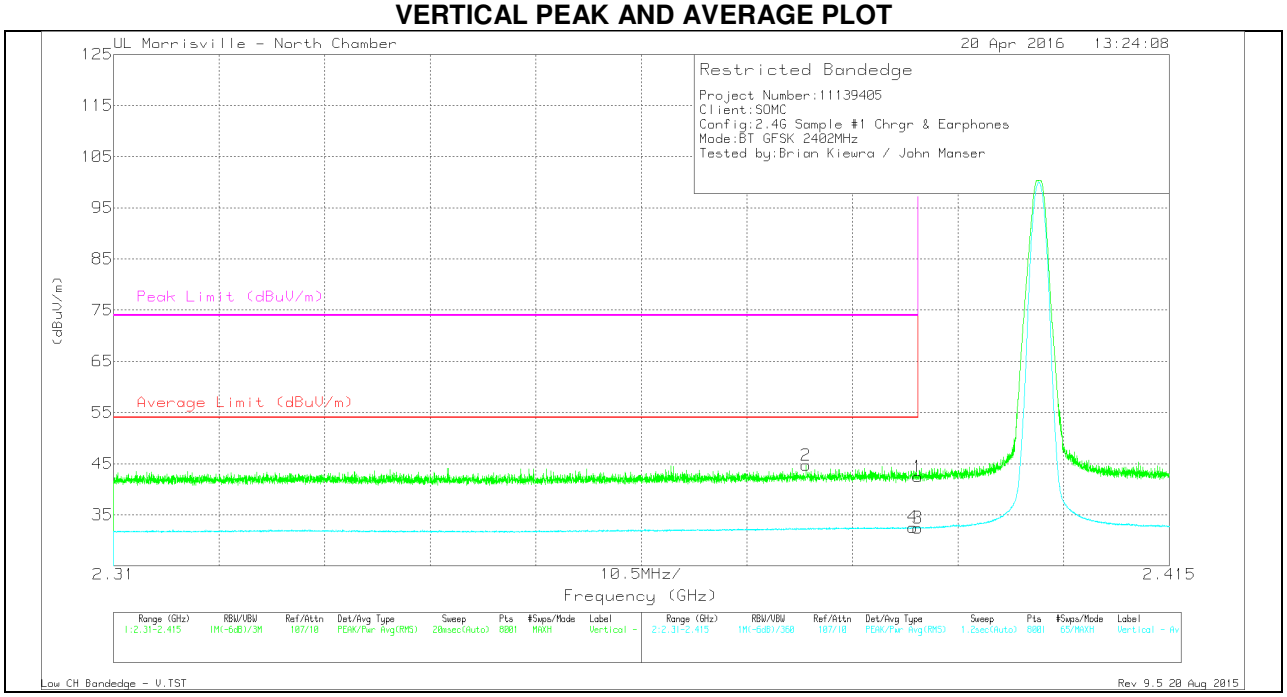
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	35.23	Pk	32.1	-24.8	42.53	-	-	74	-31.47	284	149	H
2	* 2.386	37.23	Pk	32.1	-24.8	44.53	-	-	74	-29.47	284	149	H
3	* 2.39	25.17	V1TR	32.1	-24.8	32.47	54	-21.53	-	-	284	149	H
4	* 2.39	25.34	V1TR	32.1	-24.8	32.64	54	-21.36	-	-	284	149	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

V1TR: VB=1/Ton, RMS Average where: Ton is packet duration

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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	35.18	Pk	32.1	-24.8	42.48	-	-	74	-31.52	11	203	V
2	* 2.379	37.47	Pk	32	-24.8	44.67	-	-	74	-29.33	11	203	V
3	* 2.39	25.14	V1TR	32.1	-24.8	32.44	54	-21.56	-	-	11	203	V
4	* 2.389	25.28	V1TR	32.1	-24.8	32.58	54	-21.42	-	-	11	203	V

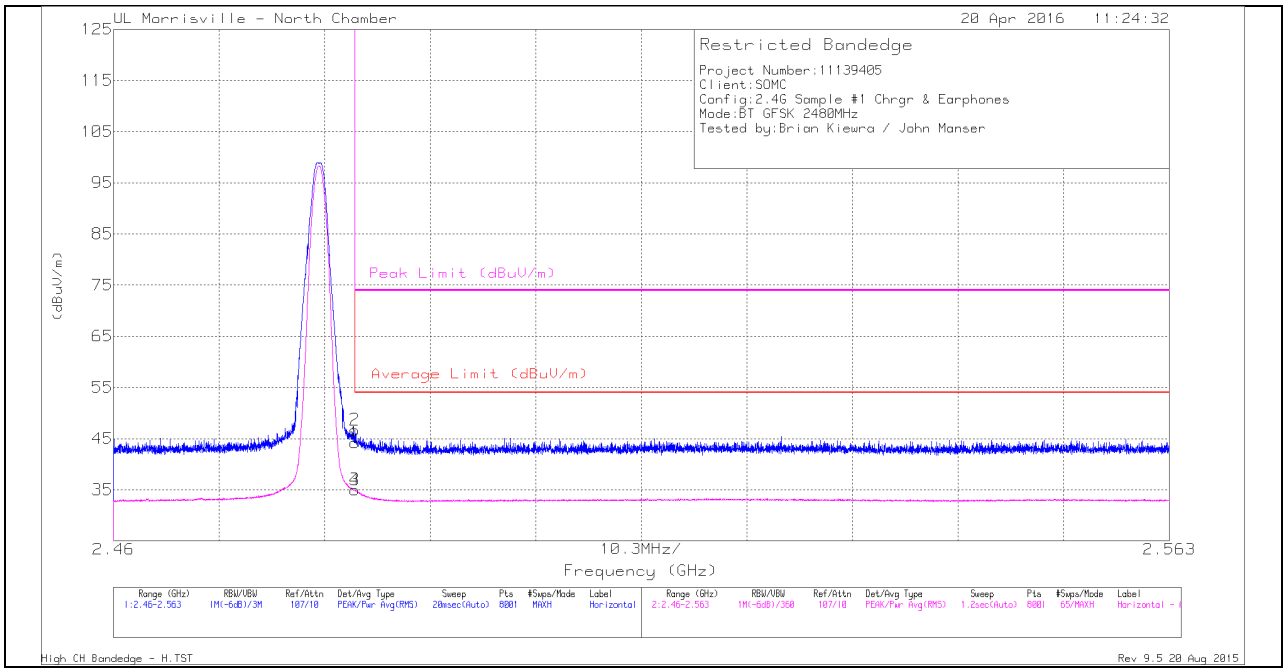
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

V1TR: VB=1/Ton, RMS Average where: Ton is packet duration

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



HORIZONTAL DATA

Trace Markers

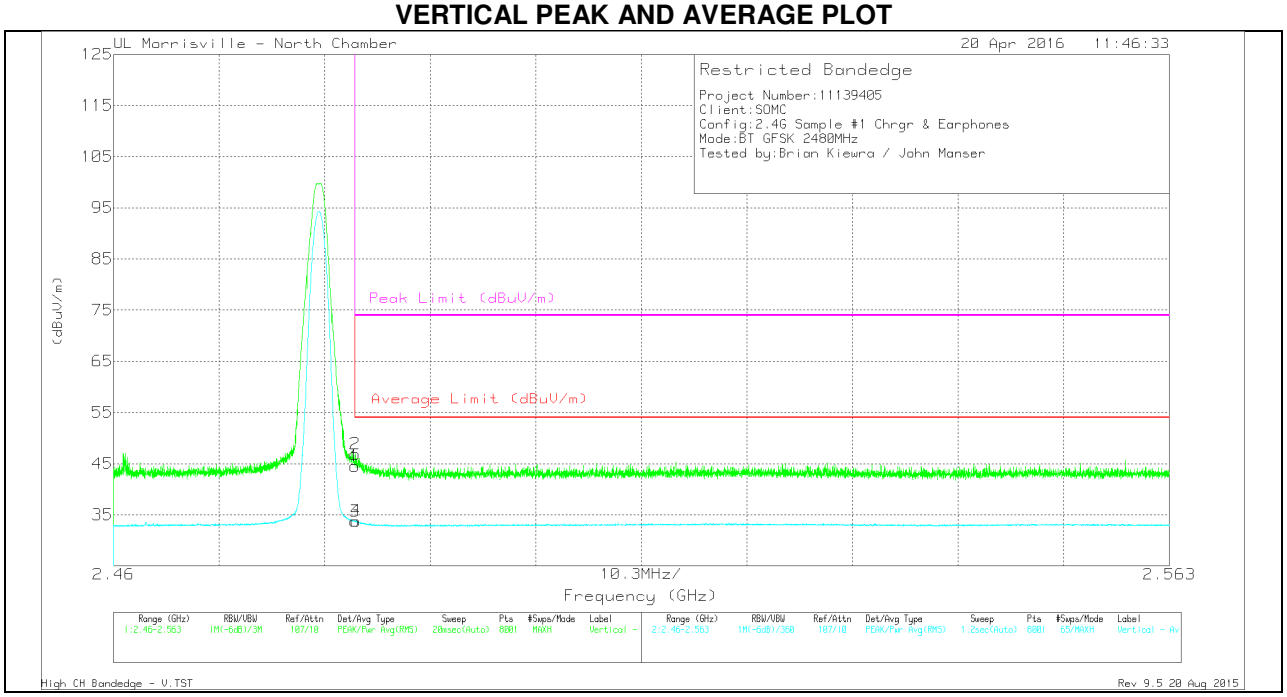
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	36.68	Pk	32.3	-24.8	44.18	-	-	74	-29.82	289	177	H
2	* 2.484	39.2	Pk	32.3	-24.8	46.7	-	-	74	-27.3	289	177	H
3	* 2.484	27.52	V1TR	32.3	-24.8	35.02	54	-18.98	-	-	289	177	H
4	* 2.484	27.47	V1TR	32.3	-24.8	34.97	54	-19.03	-	-	289	177	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

V1TR: VB=1/Ton, RMS Average where: Ton is packet duration

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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	37.02	Pk	32.3	-24.8	44.52	-	-	74	-29.48	7	153	V
2	* 2.484	39.35	Pk	32.3	-24.8	46.85	-	-	74	-27.15	7	153	V
3	* 2.484	26.21	V1TR	32.3	-24.8	33.71	54	-20.29	-	-	7	153	H
4	* 2.484	26.31	V1TR	32.3	-24.8	33.81	54	-20.19	-	-	7	153	H

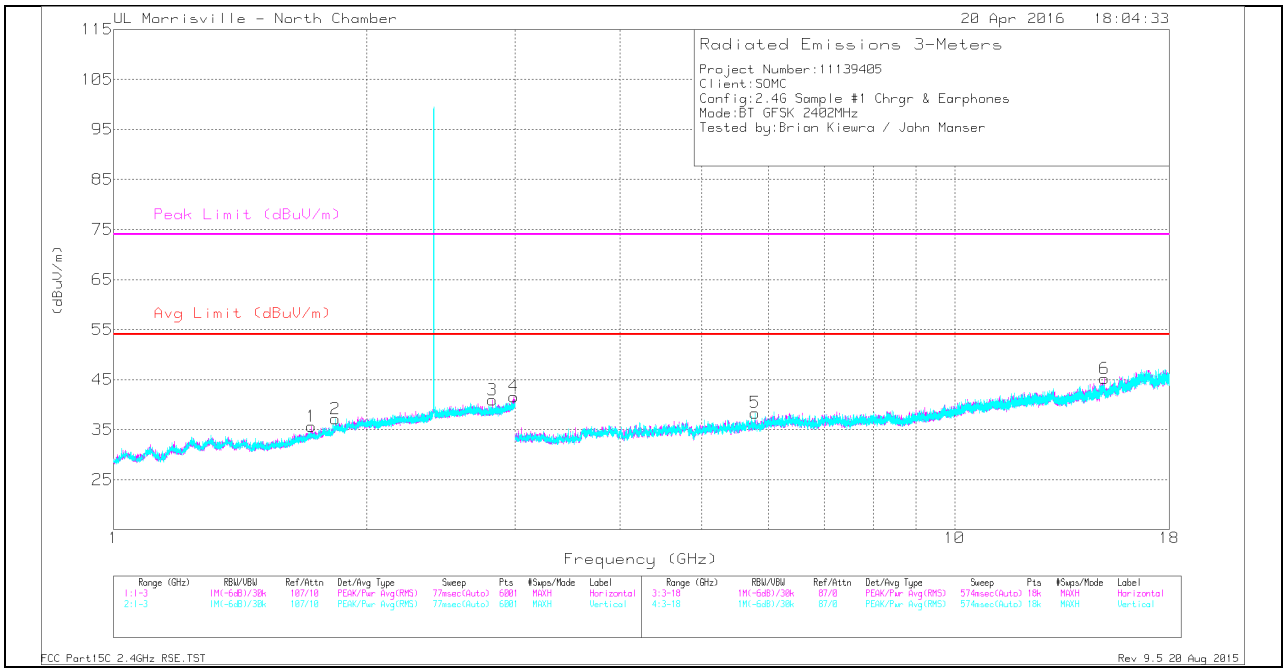
* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

V1TR: VB=1/Ton, RMS Average where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL



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

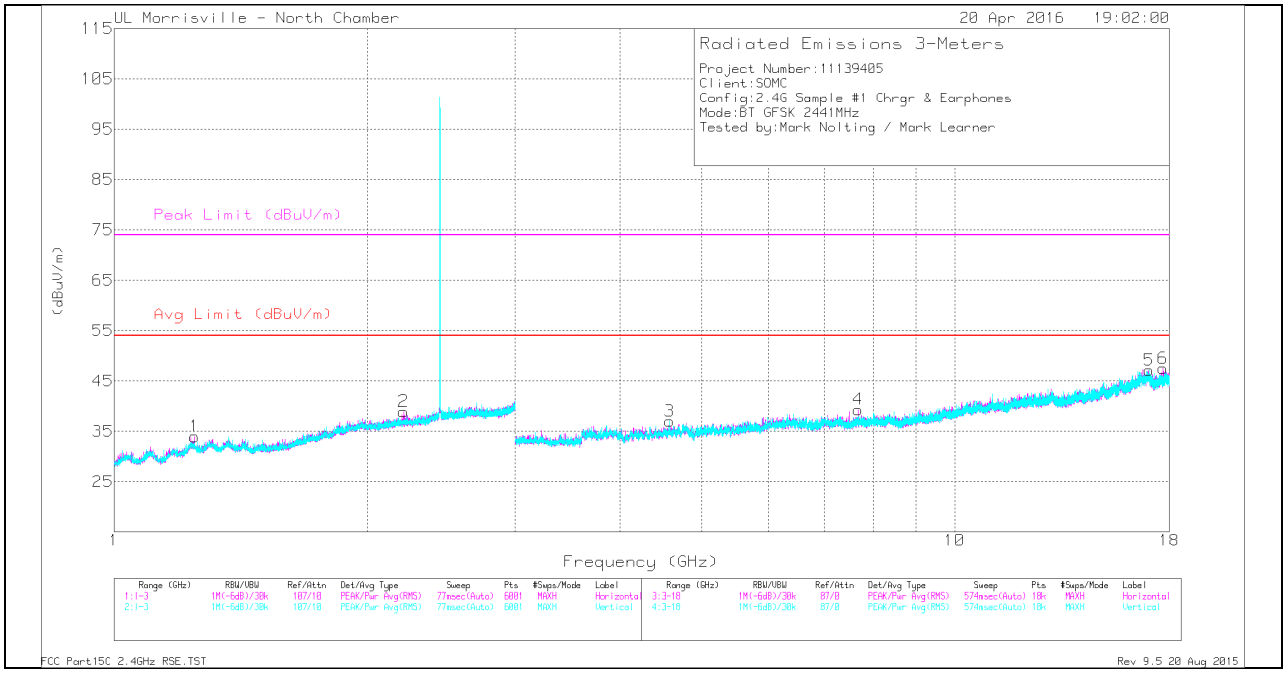
LOW CHANNEL DATA

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0072 (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	* 1.721	36.3	PK-U	29.4	-24.7	41	-	-	74	-33	178	112	H
	* 1.721	24.24	V1TR	29.4	-24.7	28.94	54	-25.06	-	-	178	112	H
3	* 2.82	37.06	PK-U	32.3	-24.2	45.16	-	-	74	-28.84	328	153	H
	* 2.819	25.06	V1TR	32.3	-24.2	33.16	54	-20.84	-	-	328	153	H
2	1.835	31.15	Pk	30.7	-24.7	37.15	-	-	-	-	0-360	101	V
4	2.993	32.53	Pk	32.6	-23.5	41.63	-	-	-	-	0-360	101	H
5	5.79	35.96	Pk	34.7	-32.3	38.36	-	-	-	-	0-360	101	V
6	15.065	32.29	Pk	39.8	-26.9	45.19	-	-	-	-	0-360	101	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK-U: Maximum Peak
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration
FCC Part15C 2.4GHz RSE.TST
Rev 9.5 20 Aug 2015

MID CHANNEL



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

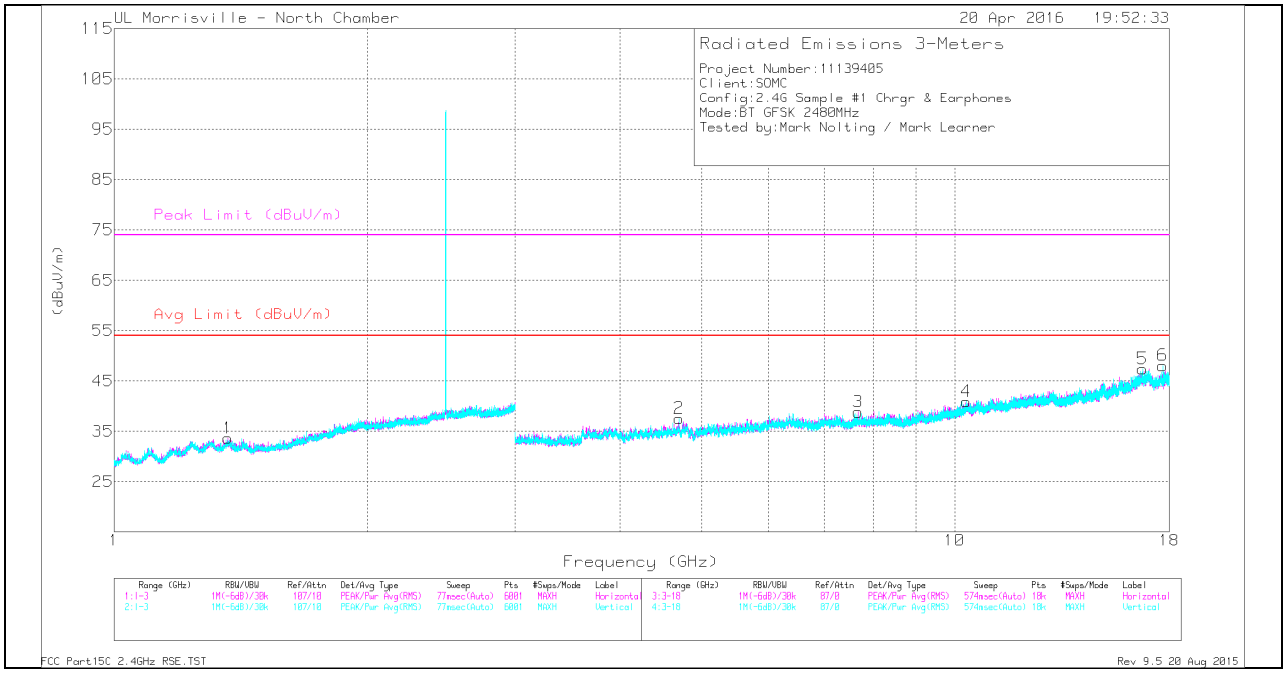
MID CHANNEL DATA

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0072 (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	* 1.245	36.08	PK-U	29.1	-26.2	38.98	-	-	74	-35.02	360	200	H
	* 1.245	24.69	V1TR	29.1	-26.2	27.59	54	-26.41	-	-	360	200	H
2	* 2.209	36.61	PK-U	31.7	-24.7	43.61	-	-	74	-30.39	360	102	H
	* 2.211	24.79	V1TR	31.7	-24.7	31.79	54	-22.21	-	-	360	102	H
4	* 7.673	38.04	PK-U	35.6	-29.8	43.84	-	-	74	-30.16	253	199	H
	* 7.672	26.71	V1TR	35.6	-29.8	32.51	54	-21.49	-	-	253	199	H
3	* 4.58	41.99	PK-U	34.1	-32.9	43.19	-	-	74	-30.81	253	102	V
	* 4.58	29.72	V1TR	34.1	-32.9	30.92	54	-23.08	-	-	253	102	V
5	17.034	31.04	Pk	41.9	-25.8	47.14	-	-	-	-	0-360	200	V
6	17.683	30.39	Pk	41.4	-24.3	47.49	-	-	-	-	0-360	200	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK-U: Maximum Peak
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration
FCC Part15C 2.4GHz RSE.TST
Rev 9.5 20 Aug 2015

HIGH CHANNEL



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

HIGH CHANNEL DATA

RADIATED EMISSIONS

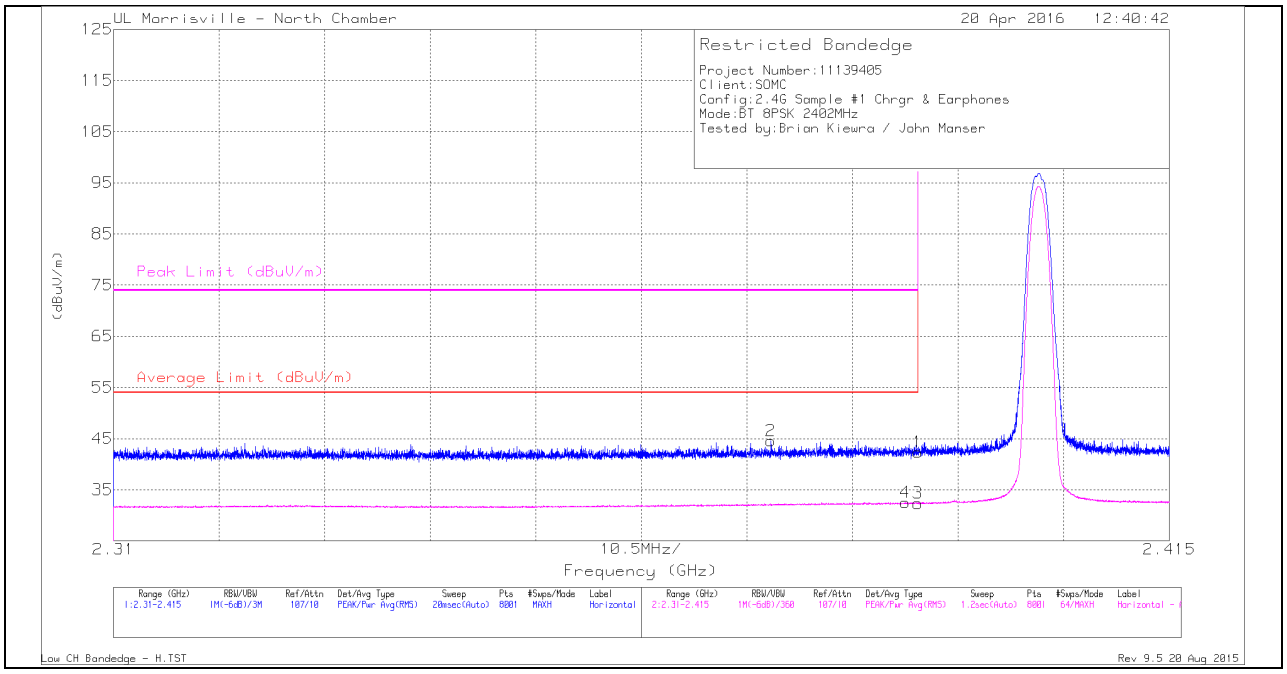
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.366	36.13	PK-U	28.9	-25.7	39.33	-	-	74	-34.67	360	200	H
	* 1.367	24.65	V1TR	28.9	-25.7	27.85	54	-26.15	-	-	360	200	H
3	* 7.672	37.7	PK-U	35.6	-29.8	43.5	-	-	74	-30.5	360	102	H
	* 7.673	26.7	V1TR	35.6	-29.8	32.5	54	-21.5	-	-	360	102	H
2	* 4.7	41.55	PK-U	34.2	-33.2	42.55	-	-	74	-31.45	213	102	V
	* 4.701	30.35	V1TR	34.2	-33.2	31.35	54	-22.65	-	-	213	102	V
4	10.317	30.04	Pk	37.3	-26.4	40.94	-	-	-	-	0-360	101	V
5	16.73	30.62	Pk	42	-25.2	47.42	-	-	-	-	0-360	101	V
6	17.674	30.98	Pk	41.4	-24.3	48.08	-	-	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK-U: Maximum Peak
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration
FCC Part15C 2.4GHz RSE.TST
Rev 9.5 20 Aug 2015

9.1.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



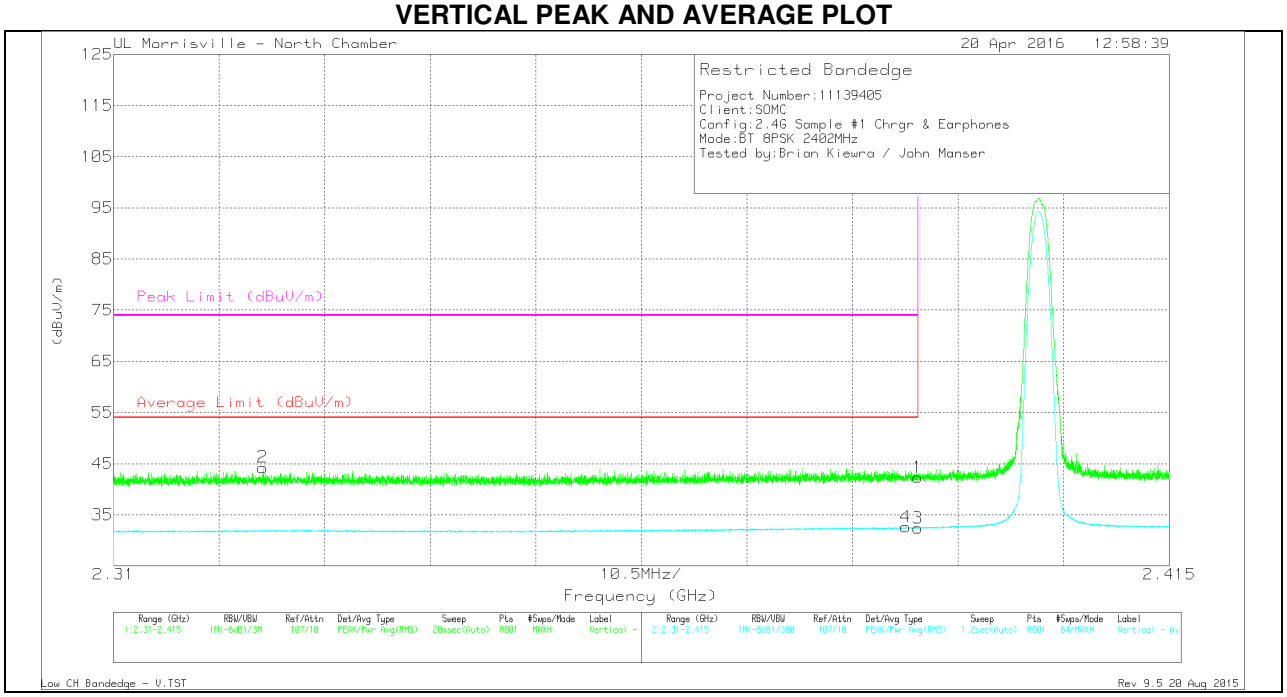
HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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	35.08	Pk	32.1	-24.8	42.38	-	-	74	-31.62	286	214	H
2	* 2.375	37.38	Pk	32	-24.8	44.58	-	-	74	-29.42	286	214	H
3	* 2.39	25.05	V1TR	32.1	-24.8	32.35	54	-21.65	-	-	286	214	H
4	* 2.389	25.24	V1TR	32.1	-24.8	32.54	54	-21.46	-	-	286	214	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

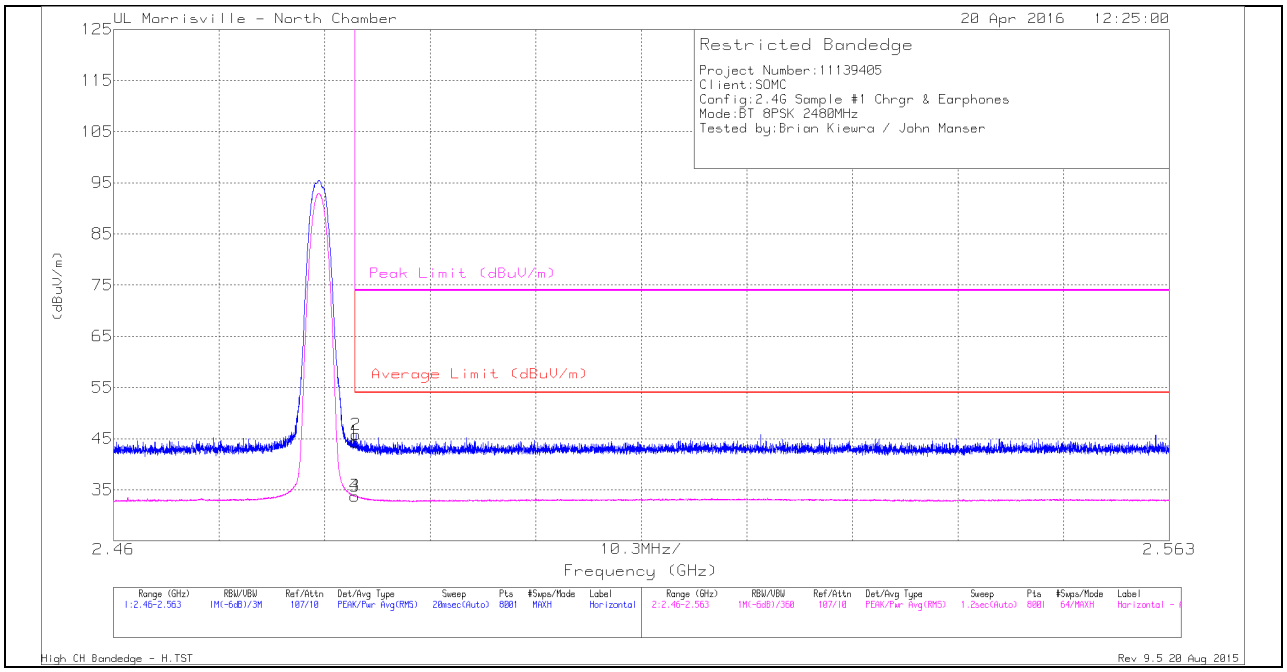
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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	35.02	Pk	32.1	-24.8	42.32	-	-	74	-31.68	8	181	V
2	* 2.325	37.26	Pk	31.7	-24.7	44.26	-	-	74	-29.74	8	181	V
3	* 2.39	25.12	V1TR	32.1	-24.8	32.42	54	-21.58	-	-	8	181	V
4	* 2.389	25.32	V1TR	32.1	-24.8	32.62	54	-21.38	-	-	8	181	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HORIZONTAL PEAK AND AVERAGE PLOT



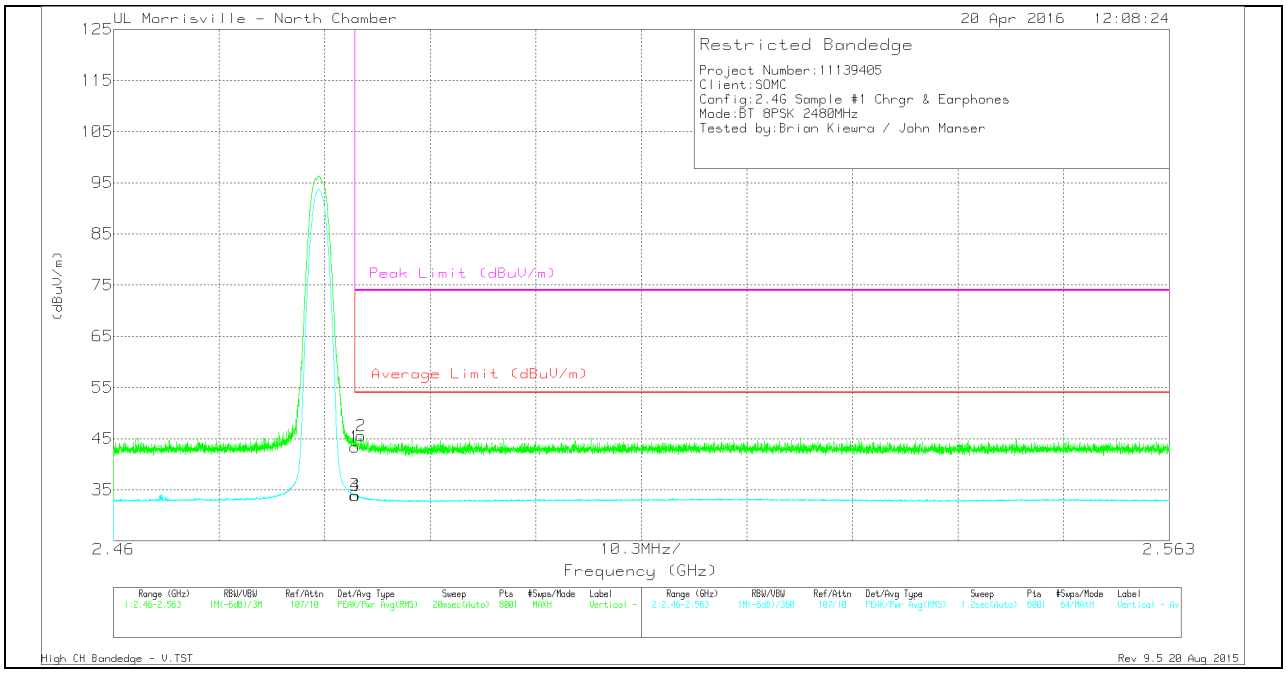
HORIZONTAL DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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	36.87	Pk	32.3	-24.8	44.37	-	-	74	-29.63	289	179	H
2	* 2.484	38.32	Pk	32.3	-24.8	45.82	-	-	74	-28.18	289	179	H
3	* 2.484	26.3	V1TR	32.3	-24.8	33.8	54	-20.2	-	-	289	179	H
4	* 2.484	26.3	V1TR	32.3	-24.8	33.8	54	-20.2	-	-	289	179	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration

VERTICAL PEAK AND AVERAGE PLOT



VERTICAL DATA

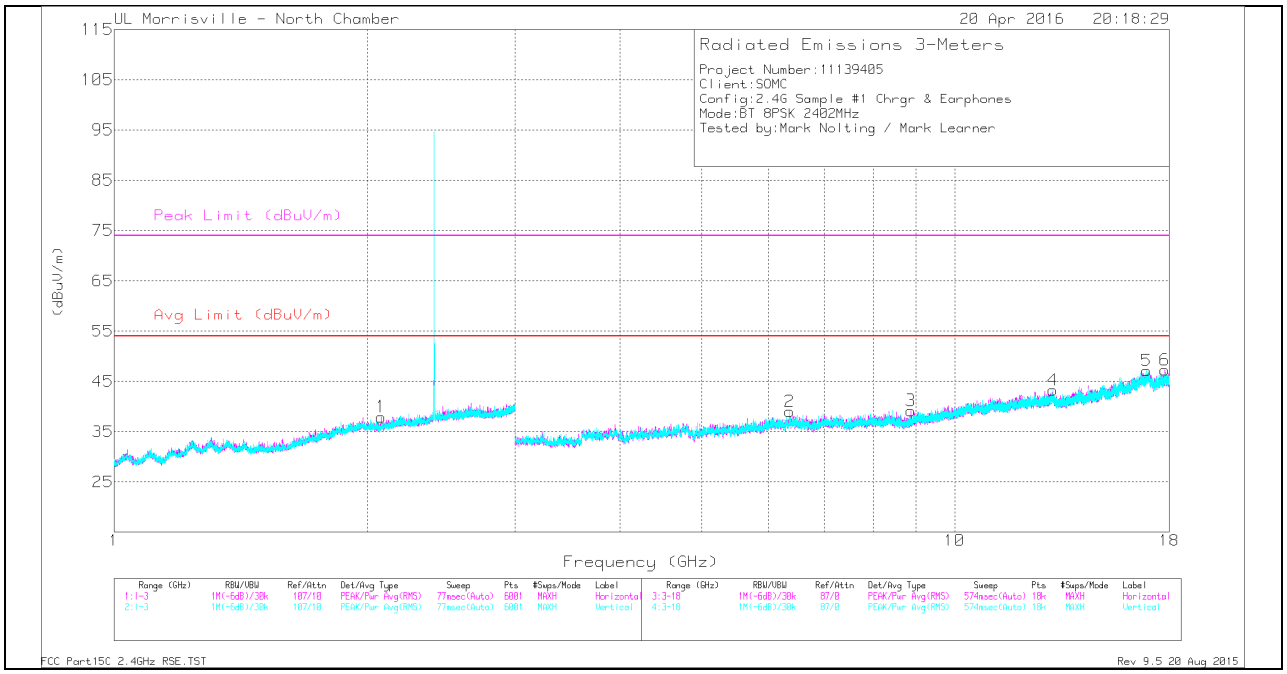
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (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	35.83	Pk	32.3	-24.8	43.33	-	-	74	-30.67	4	152	V
2	* 2.484	38.05	Pk	32.3	-24.8	45.55	-	-	74	-28.45	4	152	V
3	* 2.484	26.42	V1TR	32.3	-24.8	33.92	54	-20.08	-	-	4	152	V
4	* 2.484	26.4	V1TR	32.3	-24.8	33.9	54	-20.1	-	-	4	152	V

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band
Pk - Peak detector
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL



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

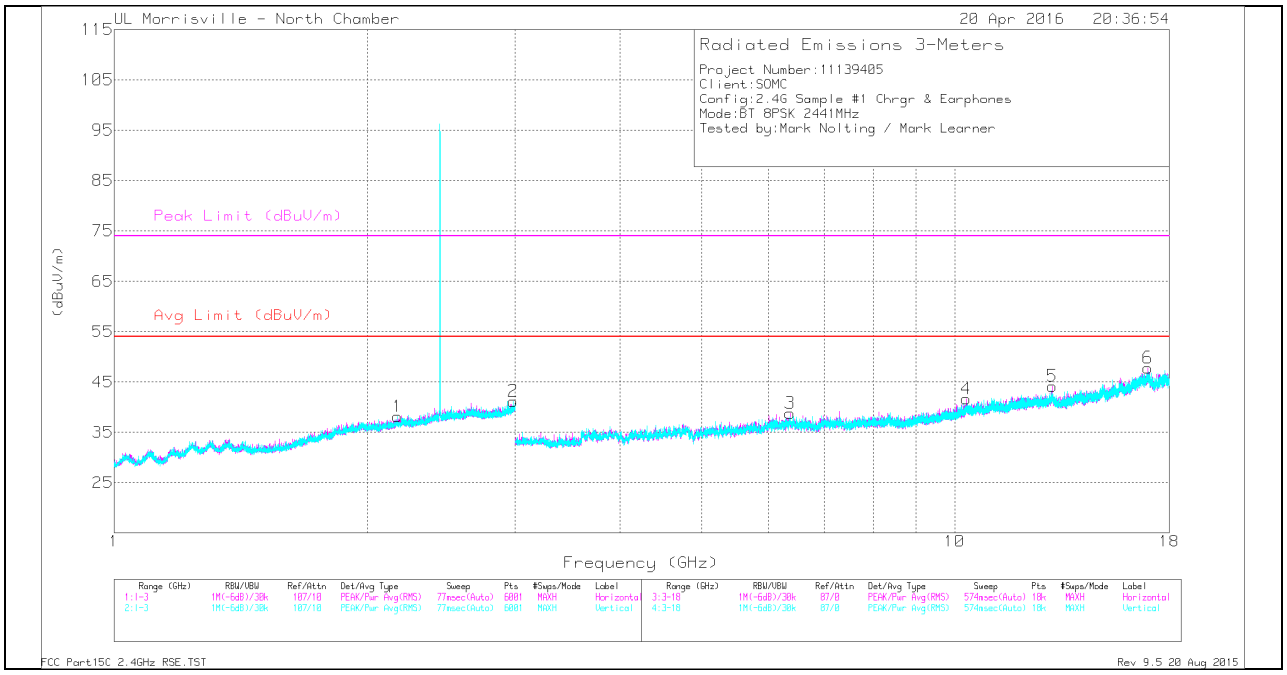
LOW CHANNEL DATA

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0072 (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
6	* 17.794	35.3	PK-U	41.5	-23.9	52.9	-	-	74	-21.1	126	101	H
	* 17.794	23.82	V1TR	41.5	-23.9	41.42	54	-12.58	-	-	126	101	H
1	2.08	31.43	Pk	31.2	-24.7	37.93	-	-	-	-	0-360	200	H
2	6.361	34.14	Pk	35.4	-30.5	39.04	-	-	-	-	0-360	199	V
3	8.866	32.97	Pk	35.9	-29.7	39.17	-	-	-	-	0-360	199	H
4	13.083	30.69	Pk	39.2	-26.6	43.29	-	-	-	-	0-360	199	V
5	16.908	29.52	Pk	42	-24.4	47.12	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK-U: Maximum Peak
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration
FCC Part15C 2.4GHz RSE.TST
Rev 9.5 20 Aug 2015

MID CHANNEL



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

MID CHANNEL DATA

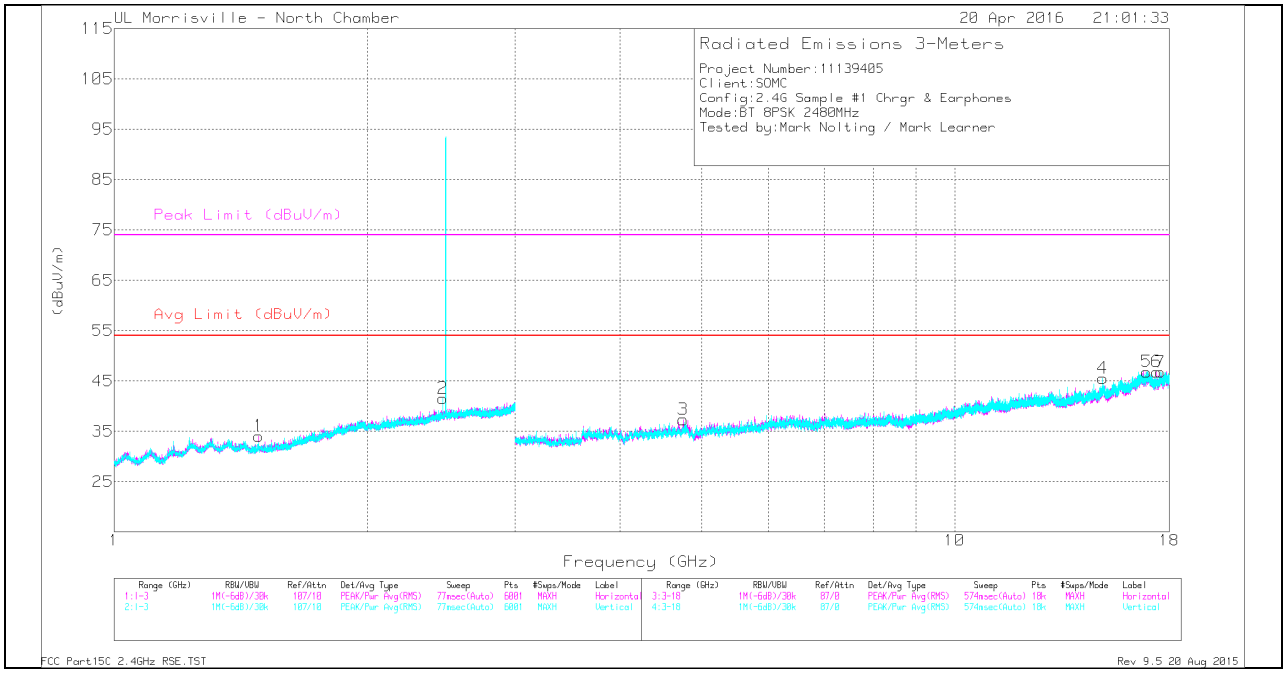
RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0072 (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	2.174	31.24	Pk	31.6	-24.7	38.14	-	-	-	-	0-360	200	V
2	2.984	32.19	Pk	32.5	-23.5	41.19	-	-	-	-	0-360	200	V
3	6.37	34.02	Pk	35.4	-30.6	38.82	-	-	-	-	0-360	200	H
4	10.32	30.65	Pk	37.3	-26.3	41.65	-	-	-	-	0-360	101	H
5	13.069	31.57	Pk	39.2	-26.6	44.17	-	-	-	-	0-360	200	H
6	16.984	31.49	Pk	41.9	-25.6	47.79	-	-	-	-	0-360	200	H

* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector
FCC Part15C 2.4GHz RSE.TST
Rev 9.5 20 Aug 2015

HIGH CHANNEL



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

HIGH CHANNEL DATA

RADIATED EMISSIONS

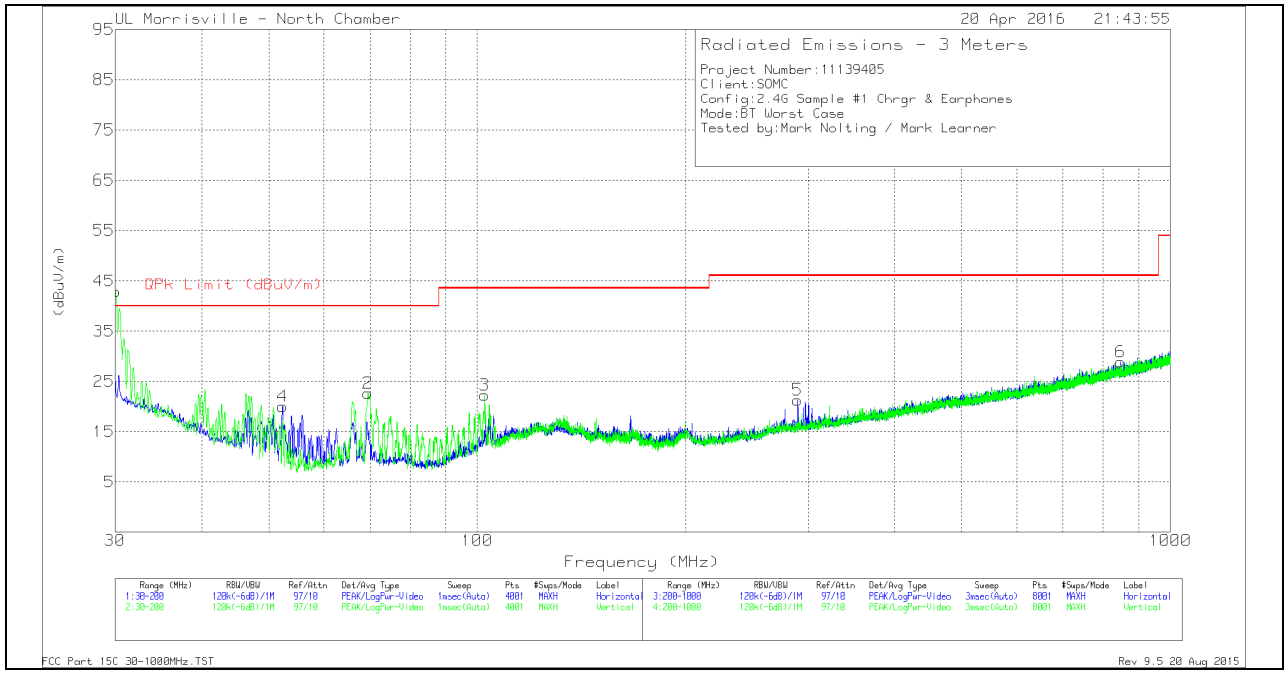
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.485	36.43	PK-U	28	-25.2	39.23	-	-	74	-34.77	1	101	H
	* 1.486	24.14	V1TR	28	-25.2	26.94	54	-27.06	-	-	1	101	H
3	* 4.752	41.81	PK-U	34.1	-32.8	43.11	-	-	74	-30.89	1	101	H
	* 4.753	30.09	V1TR	34.1	-32.8	31.39	54	-22.61	-	-	1	101	H
2	2.46	34.05	Pk	32.3	-24.8	41.55	-	-	-	-	0-360	101	V
4	15.006	32.46	Pk	39.8	-26.7	45.56	-	-	-	-	0-360	101	V
5	16.924	29.44	Pk	42	-24.6	46.84	-	-	-	-	0-360	200	V
6	17.393	30.94	Pk	41.4	-25.5	46.84	-	-	-	-	0-360	200	H
7	17.576	30.67	Pk	41.4	-25.3	46.77	-	-	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
PK-U: Maximum Peak
V1TR: VB=1/Ton, RMS Average where: Ton is packet duration
FCC Part15C 2.4GHz RSE.TST
Rev 9.5 20 Aug 2015

9.2. WORST-CASE BELOW 1 GHz

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

PLOT



BELOW 1 GHz TABLE

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.1396	37.55	Qp	26	-31.6	31.95	40	-8.05	86	119	V
4	52.355	39.14	Pk	12.1	-31.2	20.04	40	-19.96	0-360	399	H
2	69.525	41.32	Pk	12.4	-31.1	22.62	40	-17.38	0-360	103	V
3	102.4625	37.99	Pk	15.1	-30.8	22.29	43.52	-21.23	0-360	103	V
5	290	32.9	Pk	17.9	-29.5	21.3	46.02	-24.72	0-360	103	H
6	847.9	29.77	Pk	26.3	-27.2	28.87	46.02	-17.15	0-360	199	H

Pk - Peak detector
Qp - Quasi-Peak detector
FCC Part 15C 30-1000MHz.TST
Rev 9.5 20 Aug 2015

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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.

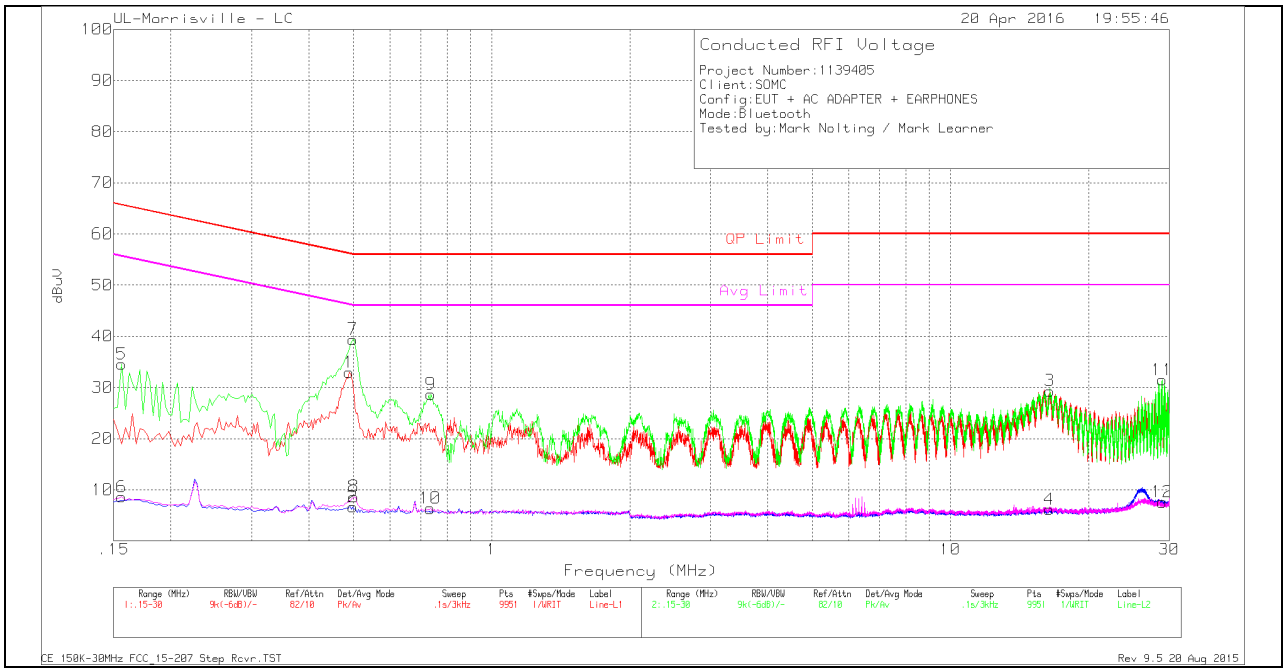
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

6 WORST EMISSIONS

PLOT



RESULT

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF [dB]	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
Range 1 (Line 1)										
1	.489	22.88	Pk	.1	10	32.98	56.18	-23.2	-	-
2	.498	-3.42	Av	.1	10	6.68	-	-	46.03	-39.35
3	16.467	18.64	Pk	.2	10.5	29.34	60	-30.66	-	-
4	16.401	-4.54	Av	.2	10.5	6.16	-	-	50	-43.84
Range 2 (Line 2)										
5	.156	24.34	Pk	.2	10	34.54	65.67	-31.13	-	-
6	.156	-1.58	Av	.2	10	8.62	-	-	55.67	-47.05
7	.498	29.31	Pk	.1	10	39.41	56.03	-16.62	-	-
8	.501	-1.33	Av	0	10	8.67	-	-	46	-37.33
9	.738	18.7	Pk	0	10	28.7	56	-27.3	-	-
10	.735	-3.64	Av	0	10	6.36	-	-	46	-39.64
11	28.956	20.46	Pk	.3	10.7	31.46	60	-28.54	-	-
12	28.956	-3.41	Av	.3	10.7	7.59	-	-	50	-42.41

Pk - Peak detector
Av - Average detection