



FCC 47 CFR PART 15 SUBPART C

**CERTIFICATION TEST REPORT
FOR**

GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC

MODEL NUMBER: SM-G510F

FCC ID: A3LSMG510F

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Prepared for
SAMSUNG ELECTRONICS CO., LTD.
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

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



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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD.

EUT DESCRIPTION: GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n, ANT+ & NFC

MODEL: SM-G510F

SERIAL NUMBER: FL-253-D (CONDUCTED), FL-253-A (RADIATED)

DATE TESTED: JULY 1-14, 2014

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

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

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

Approved & Released For
UL Verification Services Inc. By:

Tested By:



PENG ZHANG
CONSUMER TECHNOLOGY DIVISION
PROJECT LEAD
UL Verification Services Inc.



CHARLES VERGONIO
CONSUMER TECHNOLOGY DIVISION
LAB ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

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

47173 Benicia Street	47266 Benicia Street
☐ Chamber A	☐ Chamber D
☒ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

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:

$$\begin{aligned}\text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m}\end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 18000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n, ANT+ & 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	11.19	13.15
2402 - 2480	Enhanced 8PSK	11.50	14.13

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

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of -4.74 dBi

5.4. WORST-CASE CONFIGURATION AND MODE

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

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

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	SAMSUNG	ETA0U81EWE	N/A	N/A
Earphone	SAMSUNG	N/A	N/A	N/A

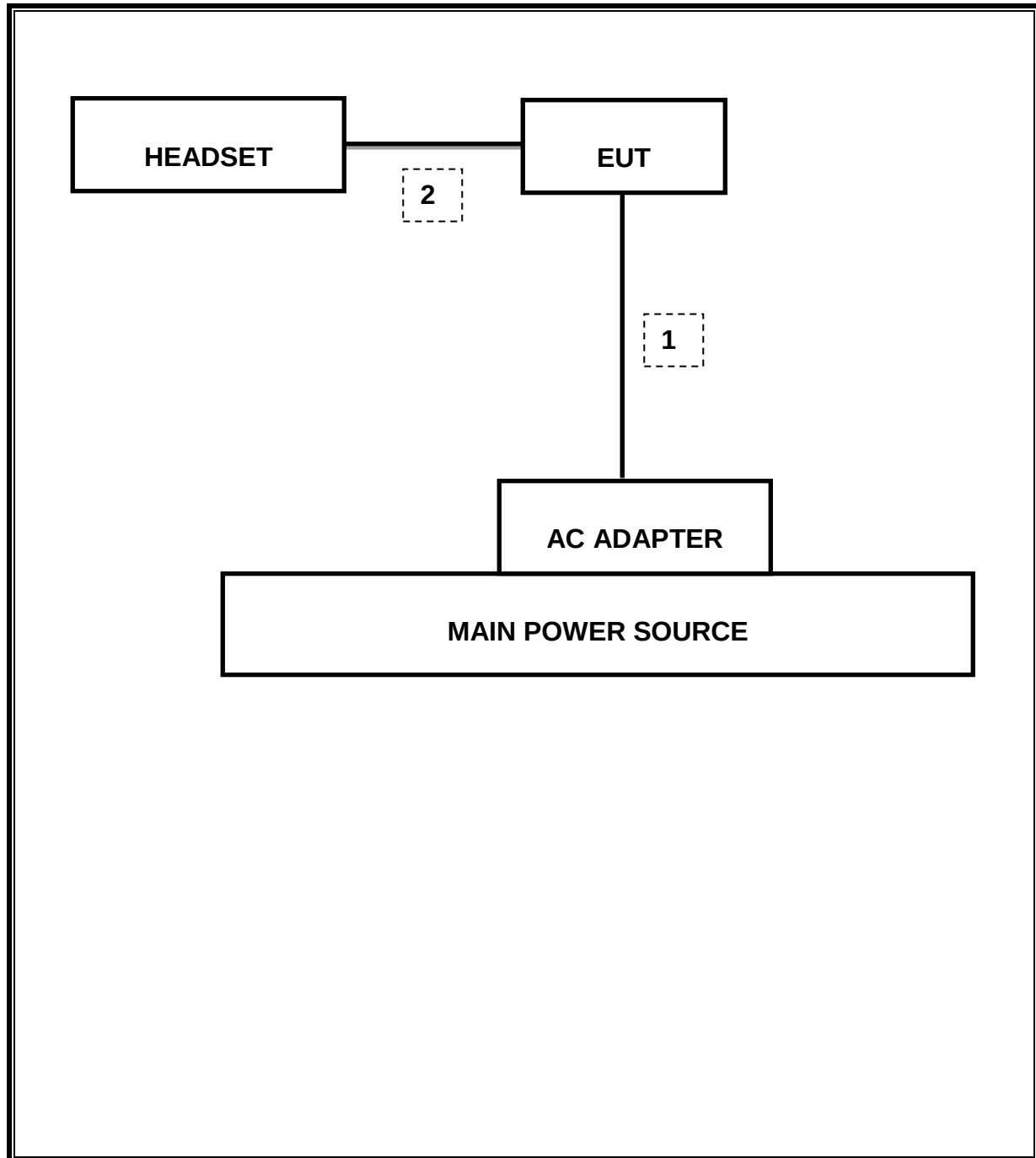
I/O CABLES

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	1.2m	N/A
2	Audio	1	Mini-Jack	Unshielded	1m	N/A

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List				
Description	Manufacturer	Model	Asset	Cal Due
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	02/13/15
Antenna, Horn, 18GHz	EMCO	3115	C00783	10/25/14
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	11/14/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/28/15
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/20/14
CBT Bluetooth Tester	R & S	CBT	None	07/12/15
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14
LISN, 30 MHz	FCC	50/250-25-2	C00626	01/14/15
Reject Filter, 2.4GHz	Micro-Tronics	BRM50702	N02684	CNR
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/14
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/14

7. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Worst Case
2.1049	RSS-GEN 4.6	Occupied Band width (99%)	N/A	Conducted	Pass	1.216MHz
2.1051, 15.247 (d)	RSS-210 A8.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass	-35.51dBm
15.247 (b)(1)	RSS-210 A8.4	TX conducted output power	<21dBm		Pass	11.50dBm
15.247 (a)(1)	RSS-210 A8.1(b)	Hopping frequency separation	> 25KHz		Pass	1 MHz
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Number of Hopping channels	More than 15 non-overlapping channels		Pass	79
15.247 (a)(1)(iii)	RSS-210 A8.1(d)	Avg Time of Occupancy	< 0.4sec		Pass	0.375sec
15.207 (a)	RSS-GEN 7.2.2	AC Power Line conducted emissions	Section 10	Radiated	Pass	42.9dBuV
15.205, 15.209	RSS-210 Clause 2.6, RSS-210 Clause 6	Radiated Spurious Emission	< 54dBuV/m		Pass	42.05dBuV/m

8. ANTENNA PORT TEST RESULTS

8.1. 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 $\geq$ 1% of the 20 dB bandwidth. The VBW is set to $\geq$ RBW. The sweep time is coupled.

RESULTS

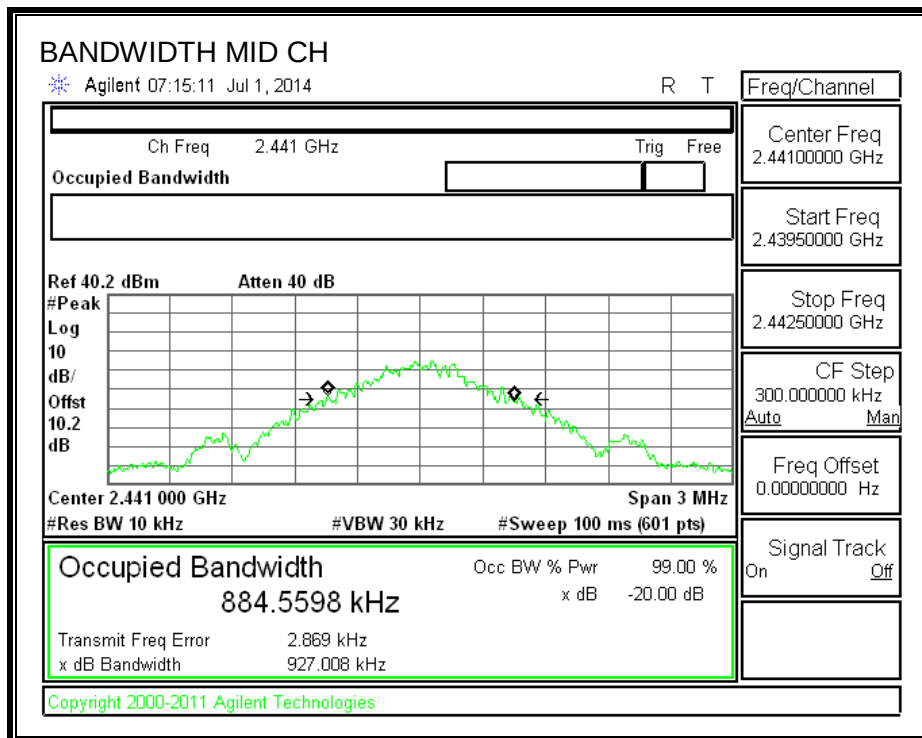
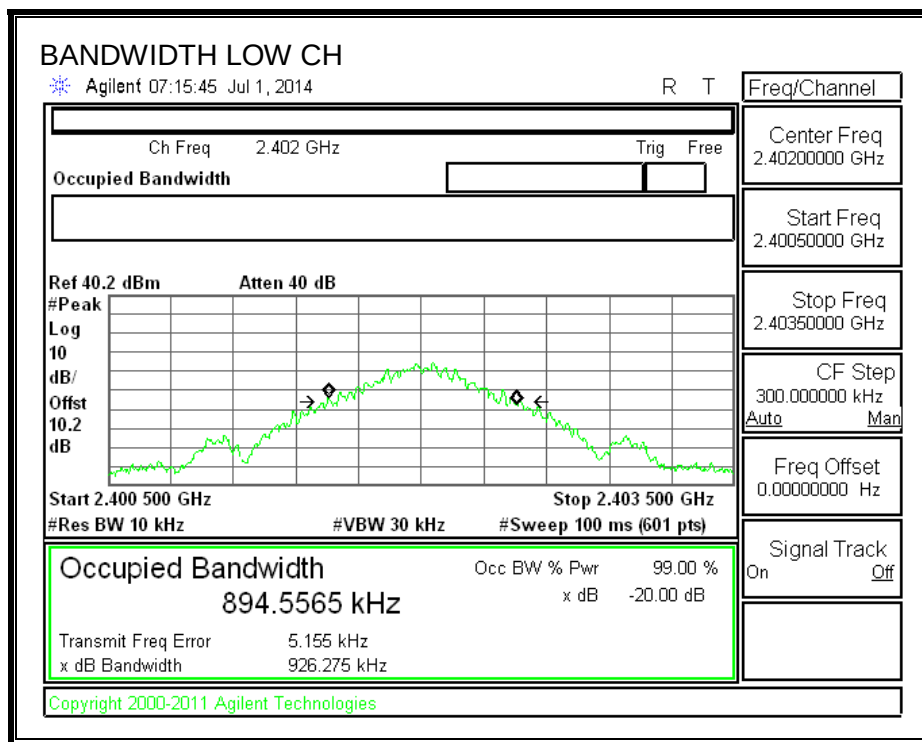
8.1.1. BASIC DATA RATE GFSK MODULATION

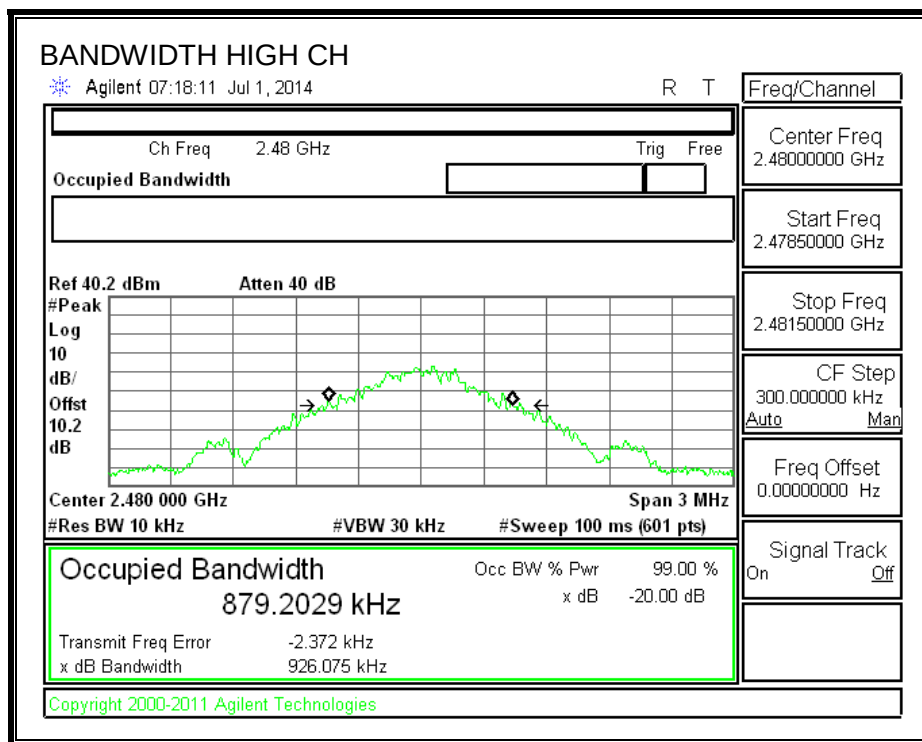
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.926	0.873
Middle	2441	0.927	0.905
High	2480	0.926	0.992
Worst		0.927	0.992

8.1.1. ENHANCED DATA RATE 8PSK MODULATION

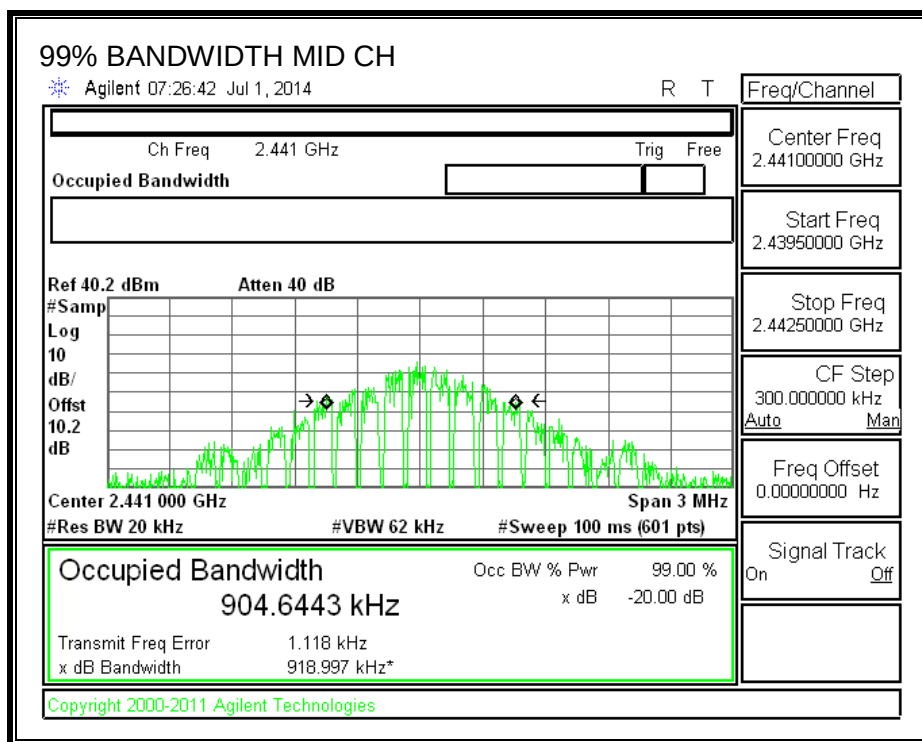
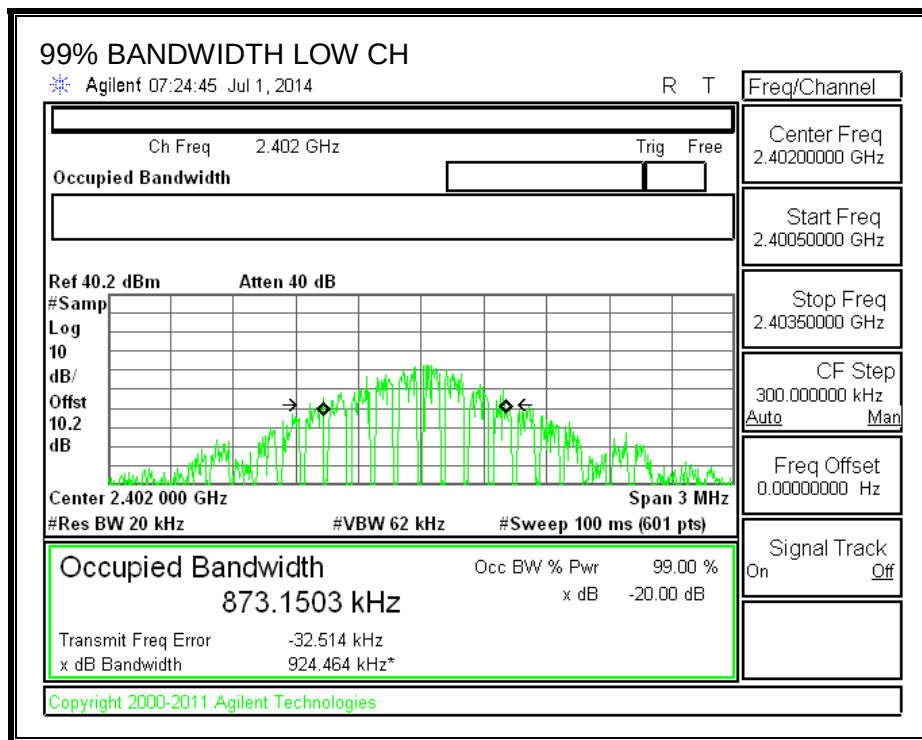
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.263	1.171
Middle	2441	1.263	1.216
High	2480	1.265	1.204
Worst		1.265	1.216

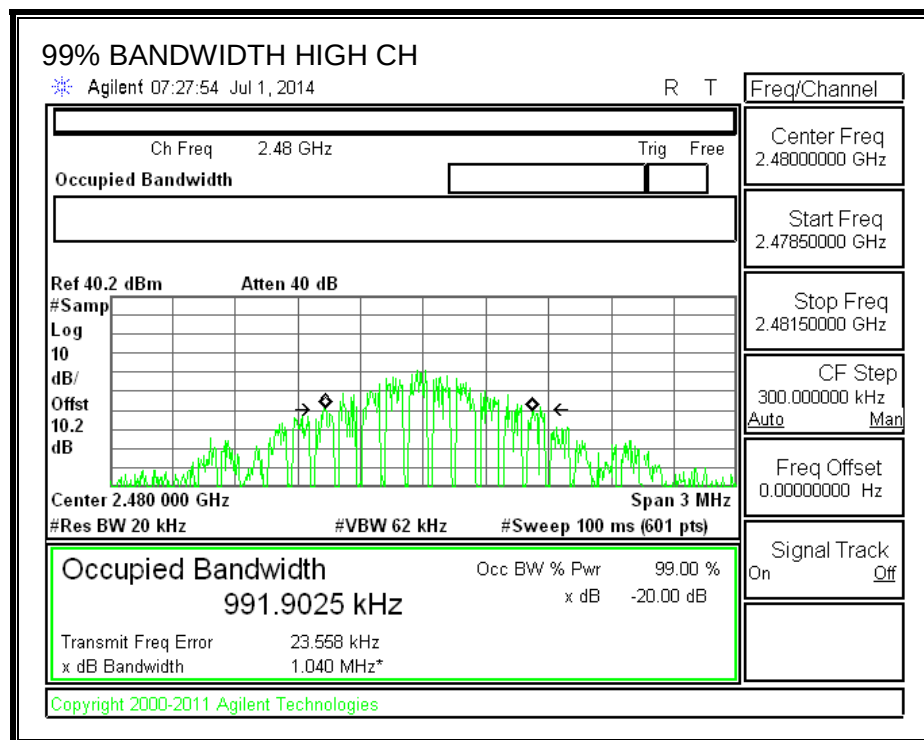
GFSK 20 dB BANDWIDTH



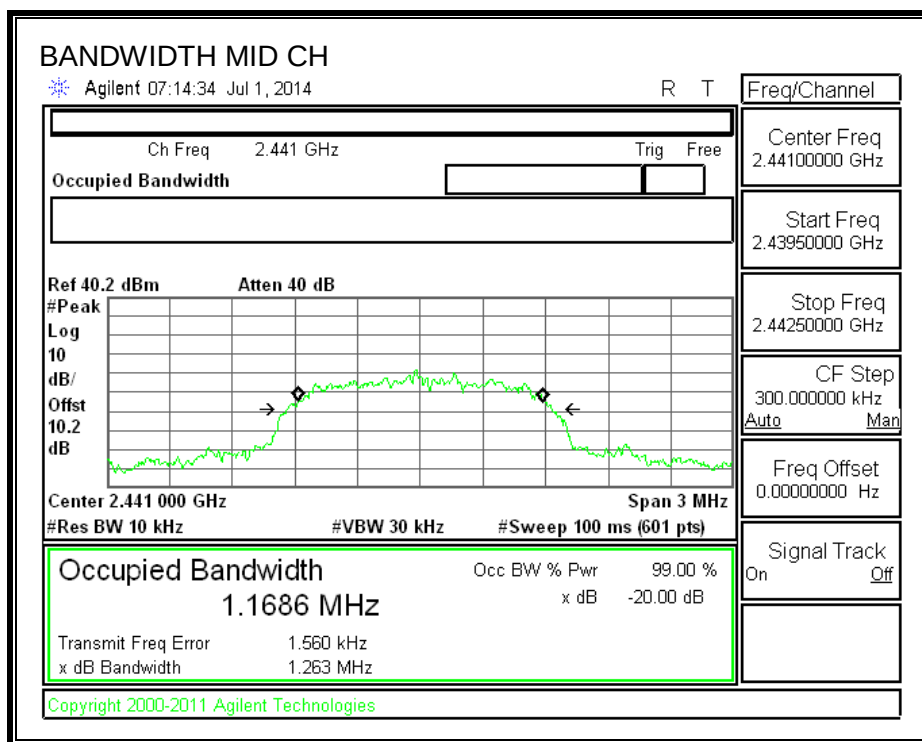
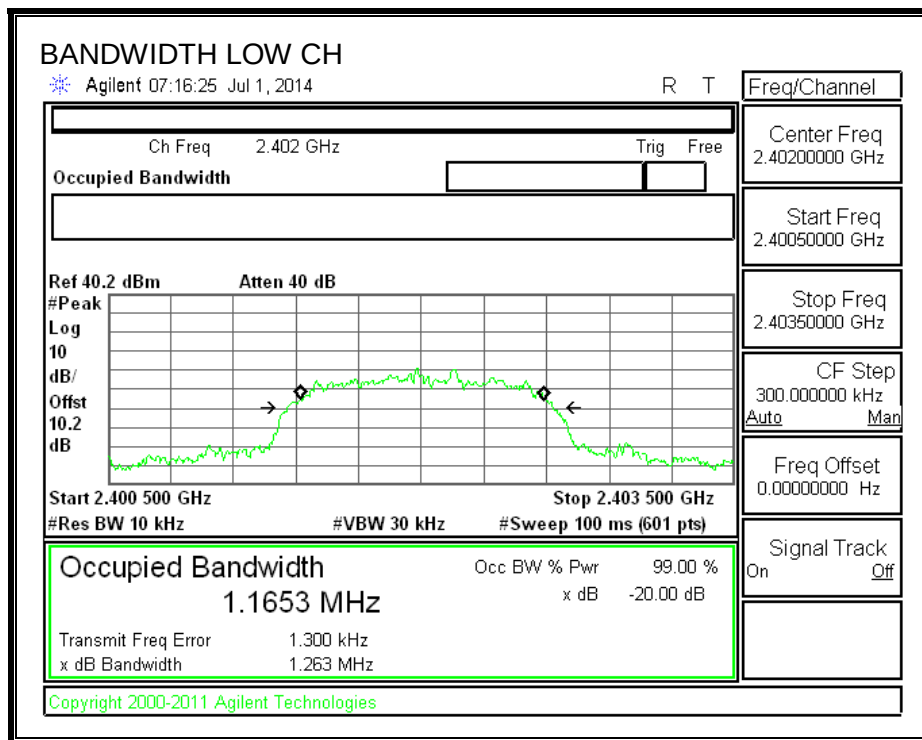


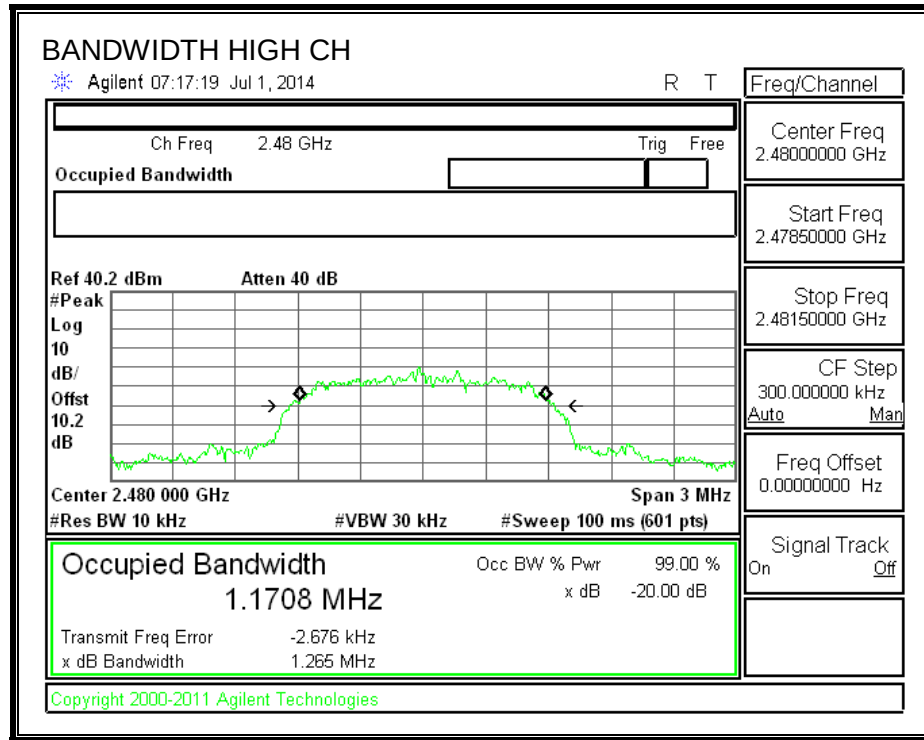
GFSK 99% BANDWIDTH



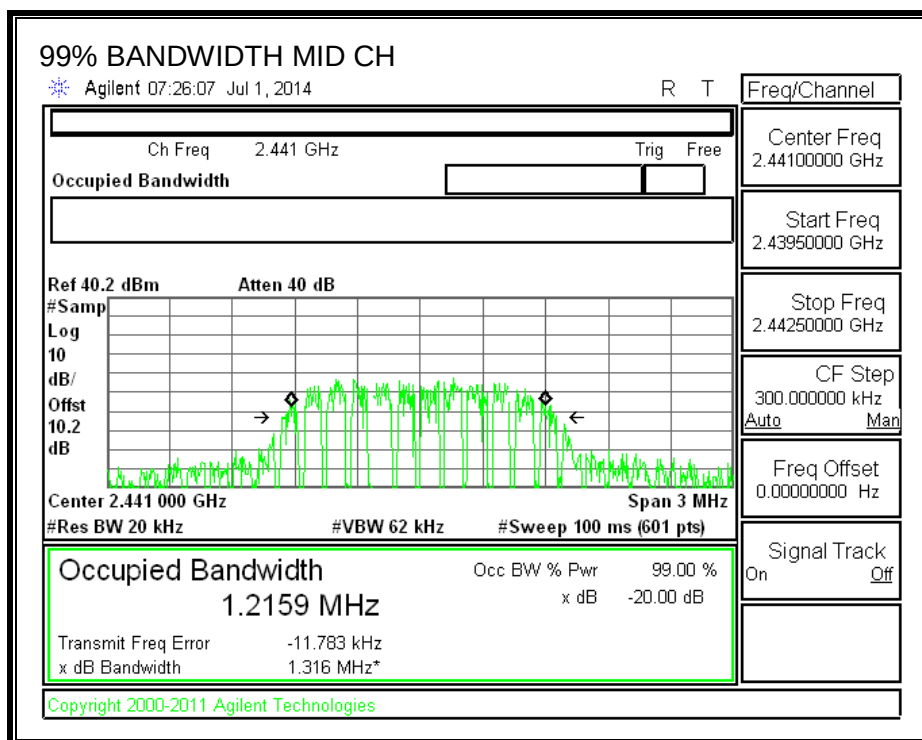
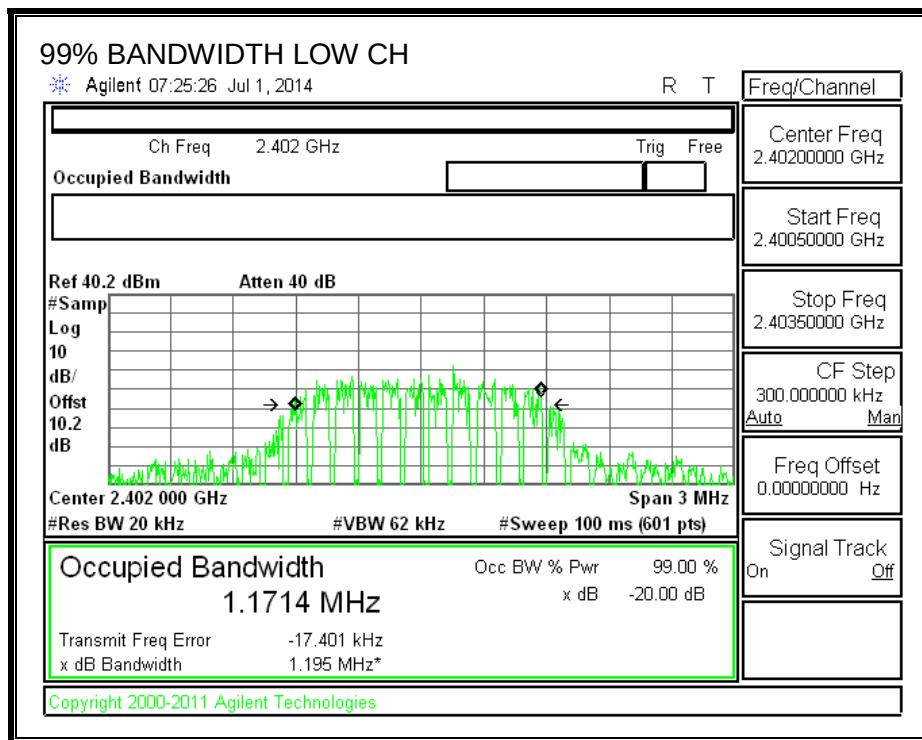


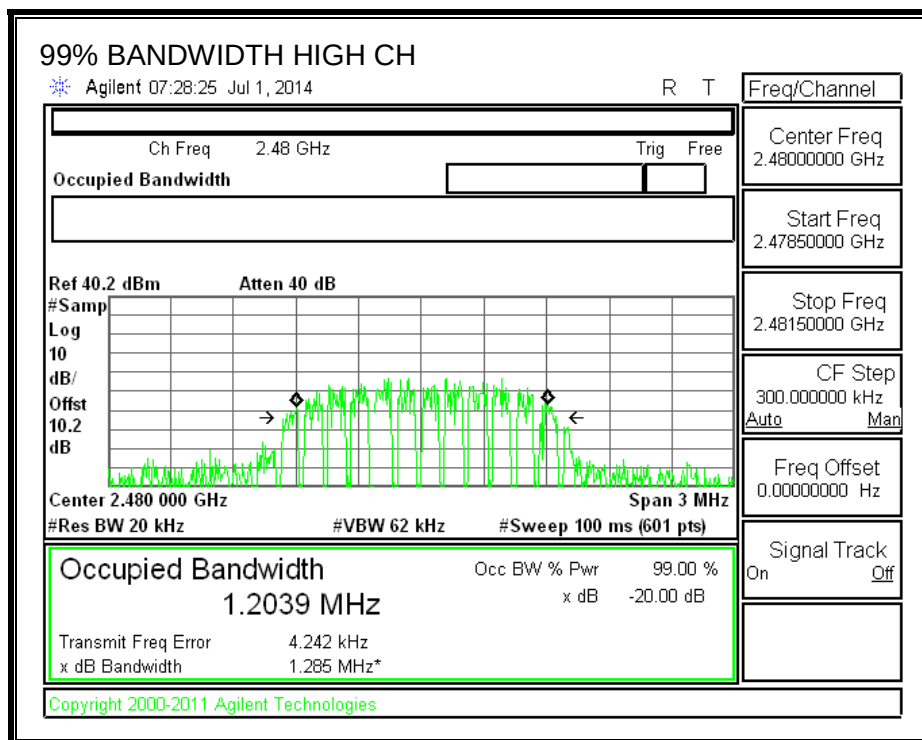
8PSK 20 dB BANDWIDTH





8PSK 99% BANDWIDTH





8.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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

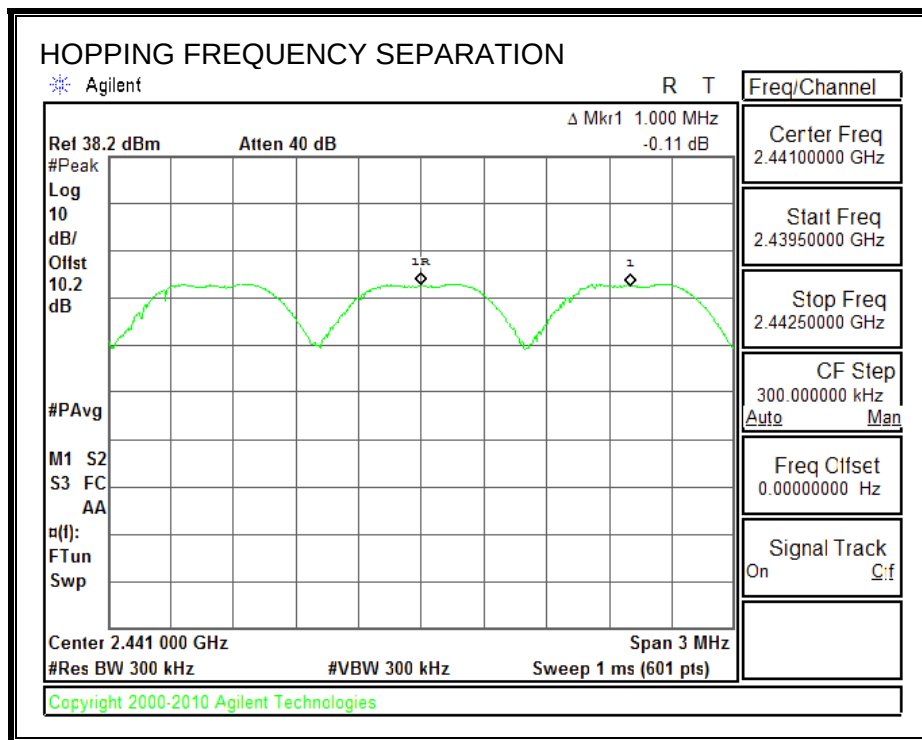
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

HOPPING FREQUENCY SEPARATION



8.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

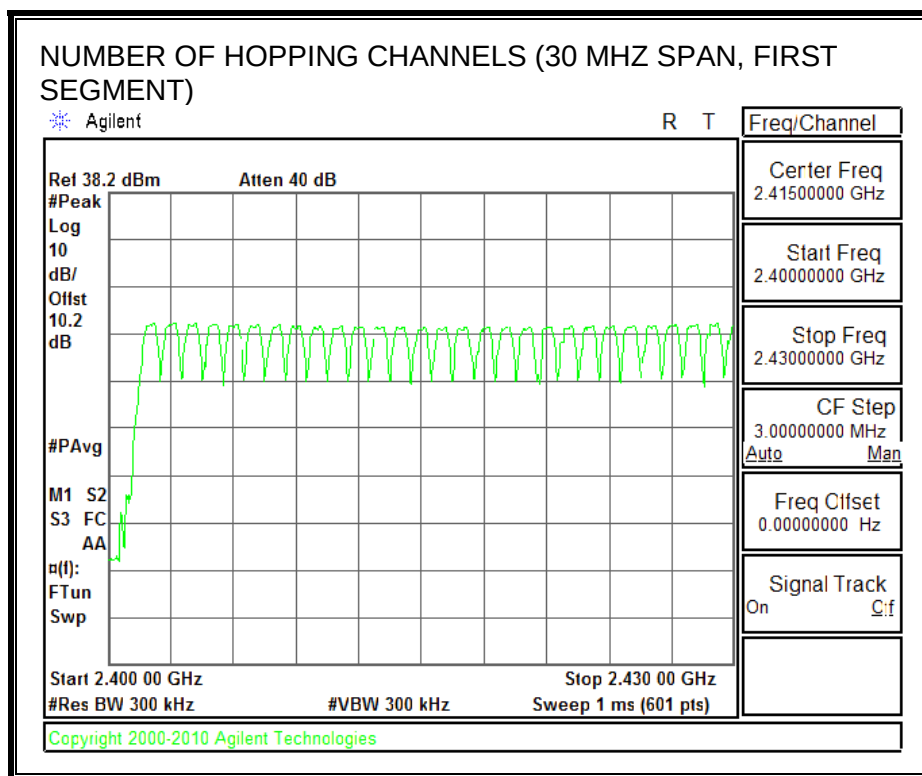
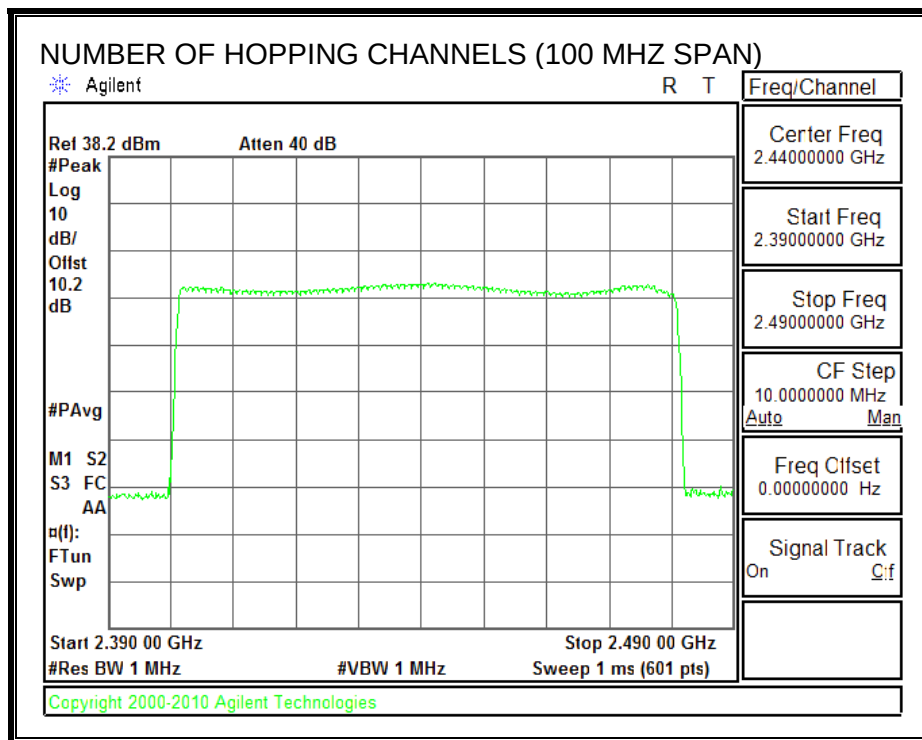
TEST PROCEDURE

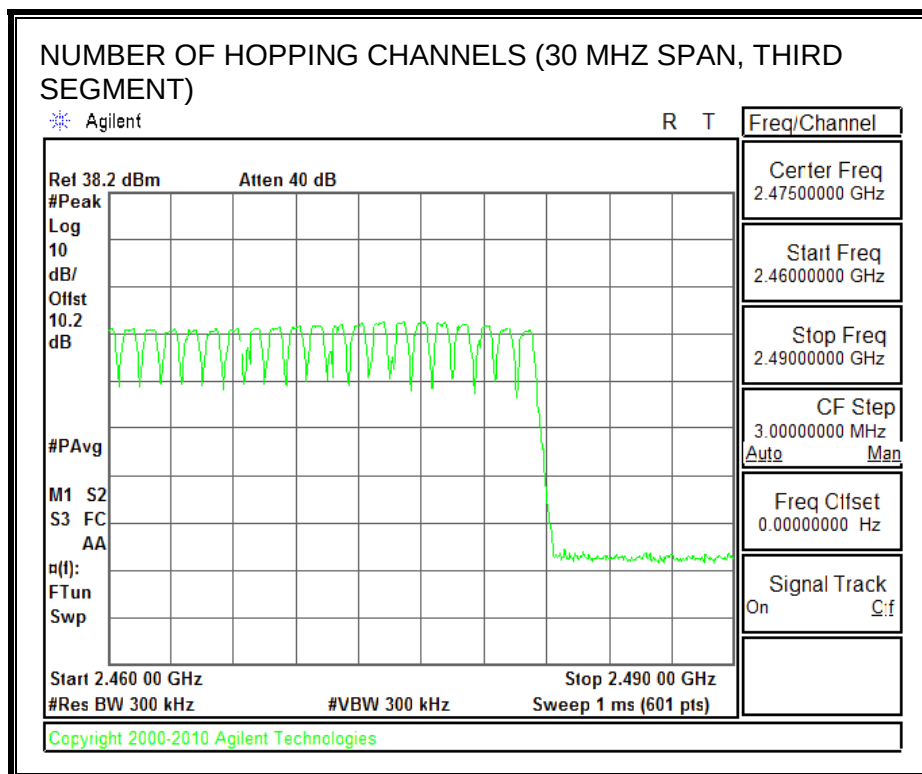
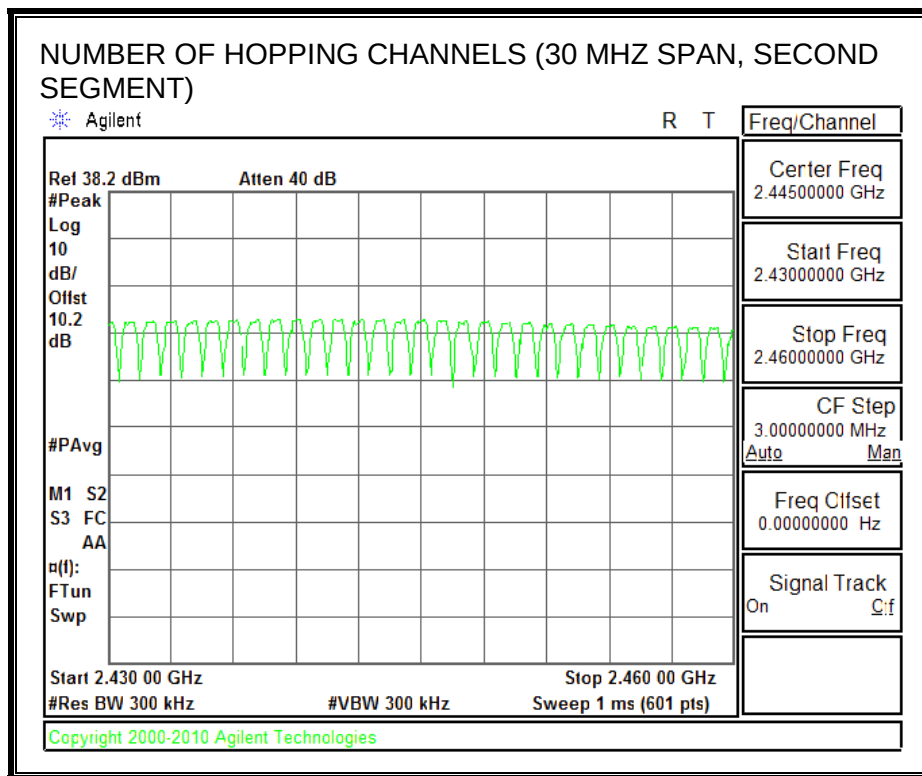
DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS





8.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

TEST PROCEDURE

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

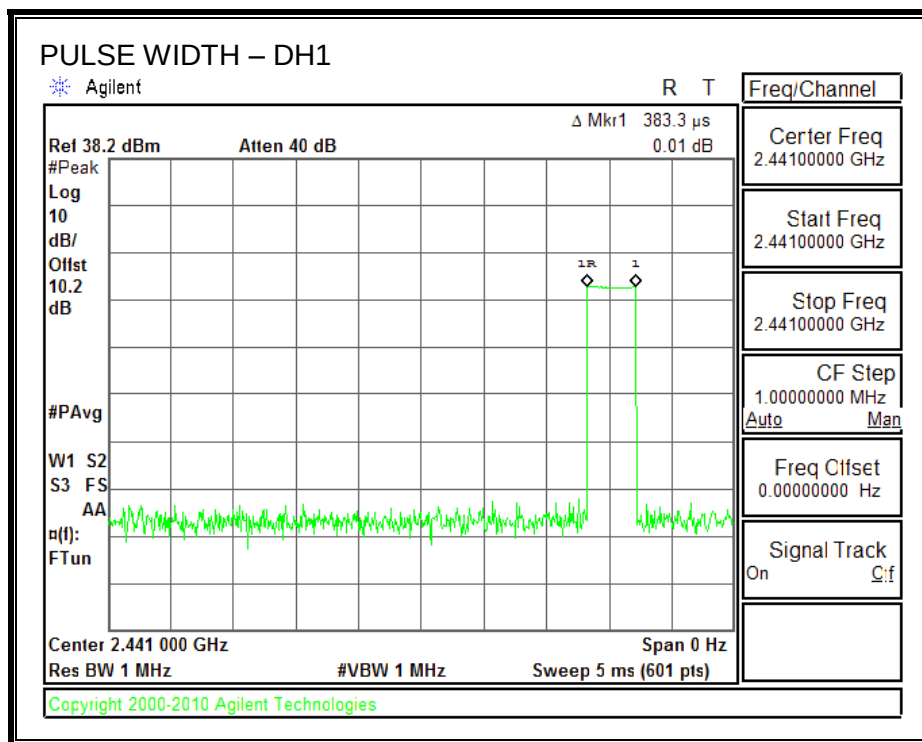
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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

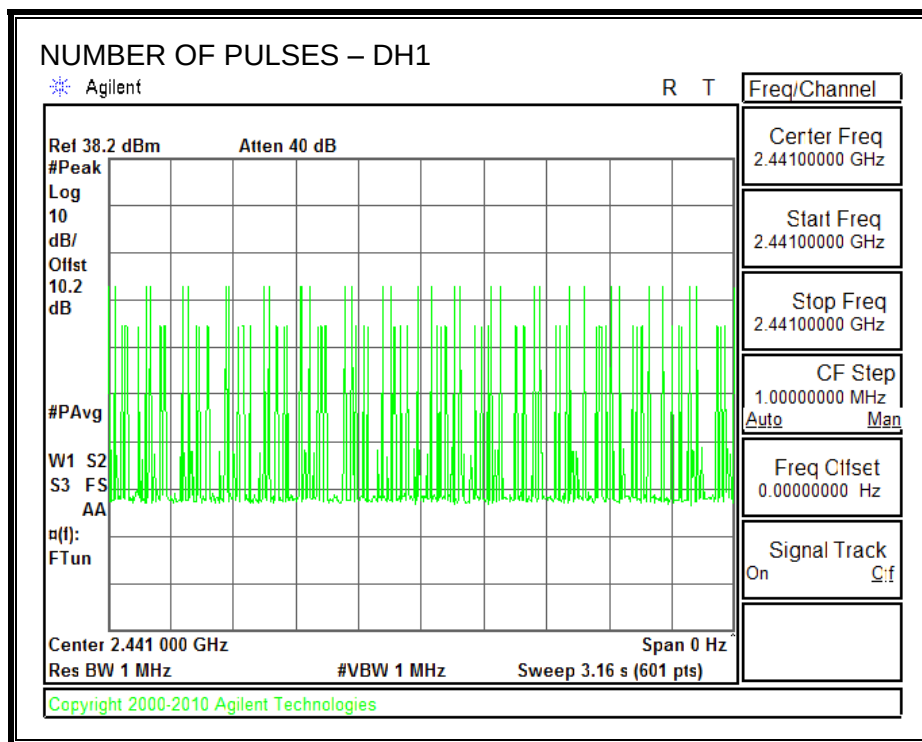
RESULTS

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	0.3833	33	0.126	0.4	-0.274
DH3	1.625	12	0.195	0.4	-0.205
DH5	2.883	13	0.375	0.4	-0.025
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	0.3833	9	0.034	0.4	-0.366
DH3	1.625	3	0.049	0.4	-0.351
DH5	2.883	4	0.115	0.4	-0.285

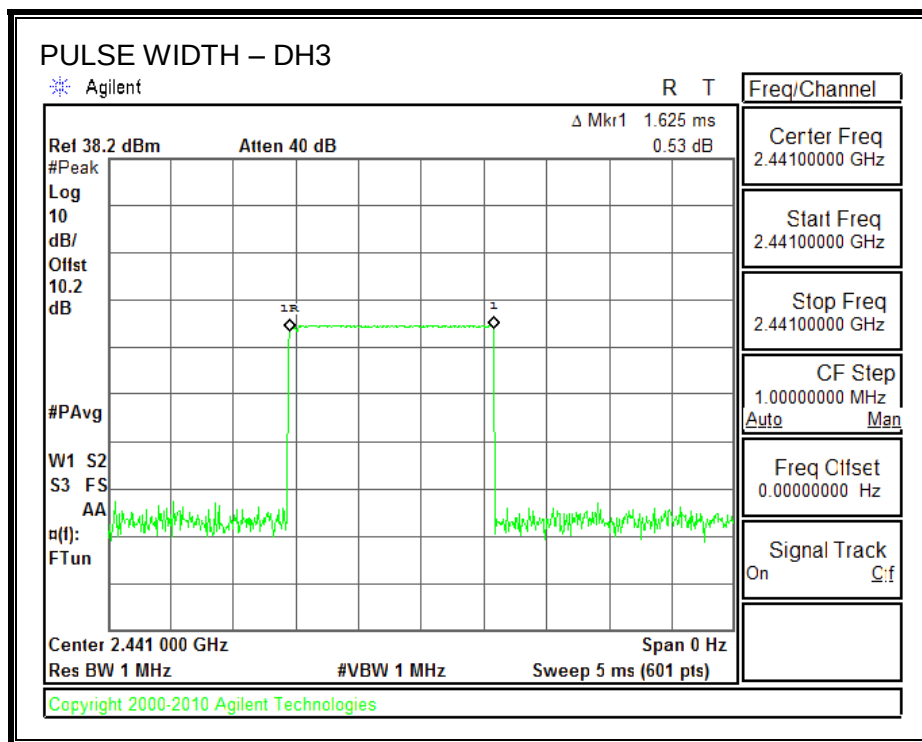
PULSE WIDTH - DH1



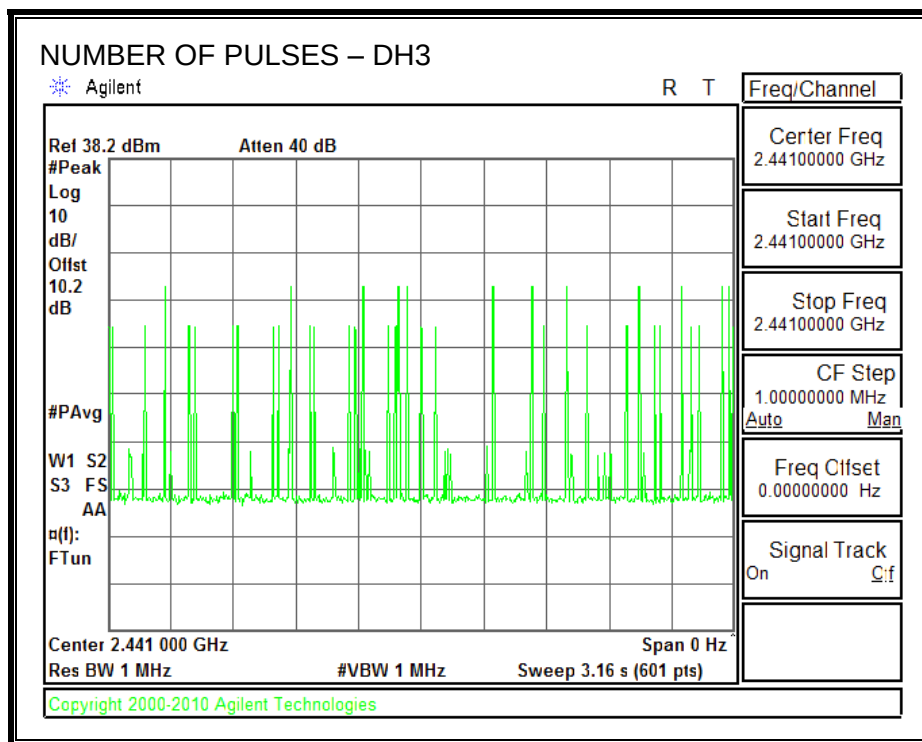
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD - DH1



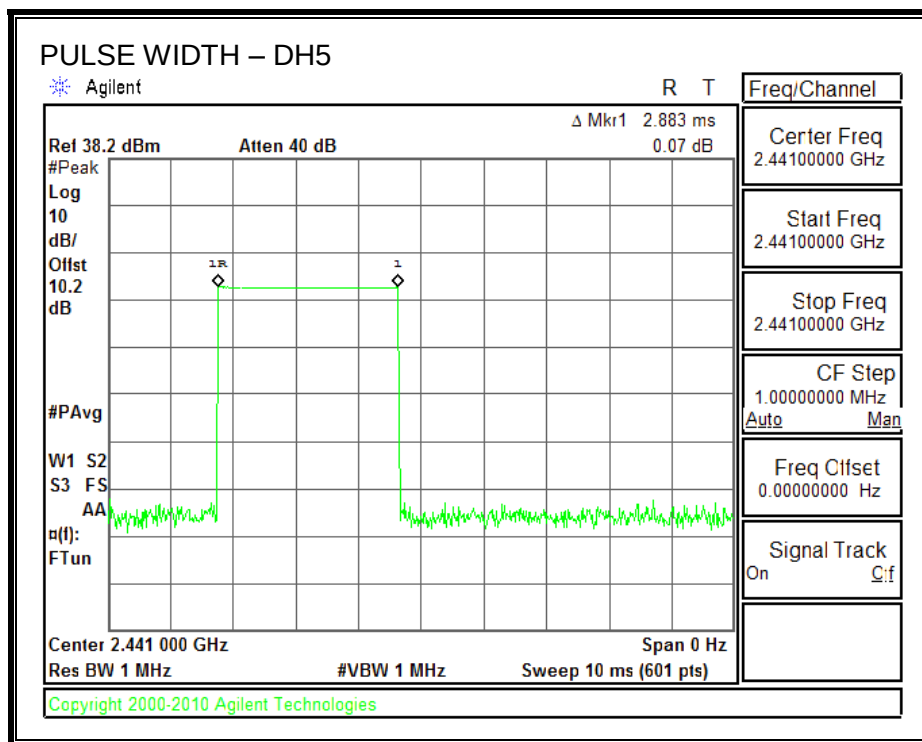
PULSE WIDTH – DH3



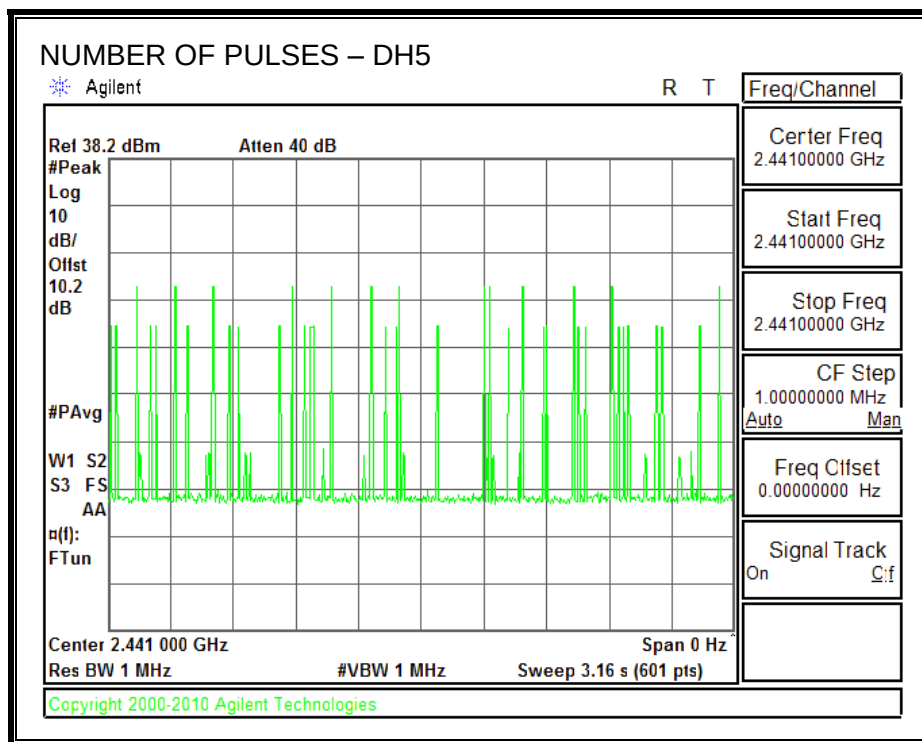
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



8.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

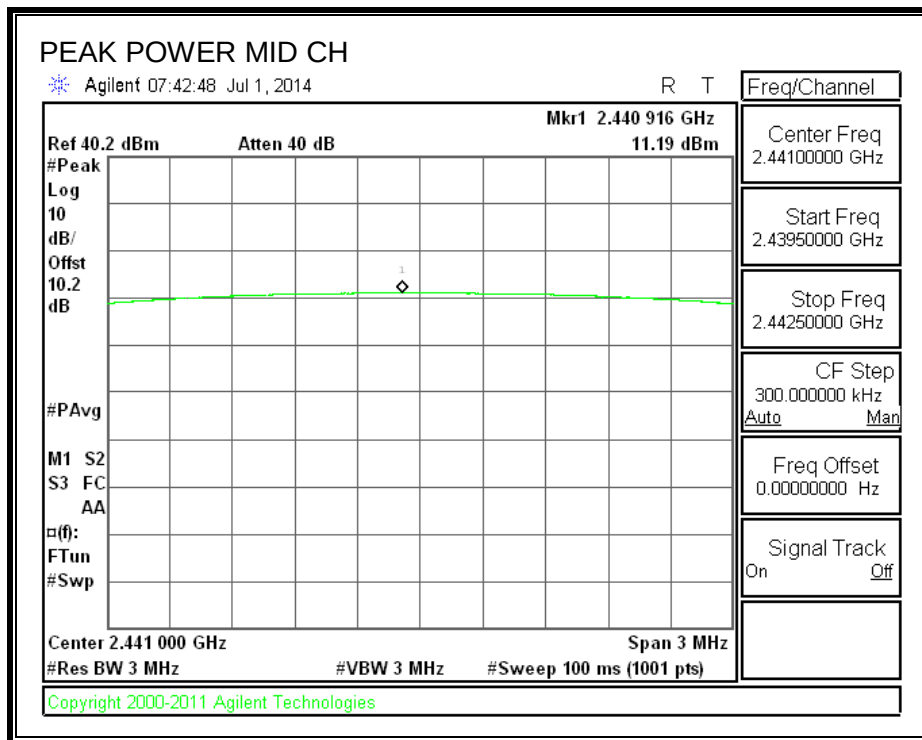
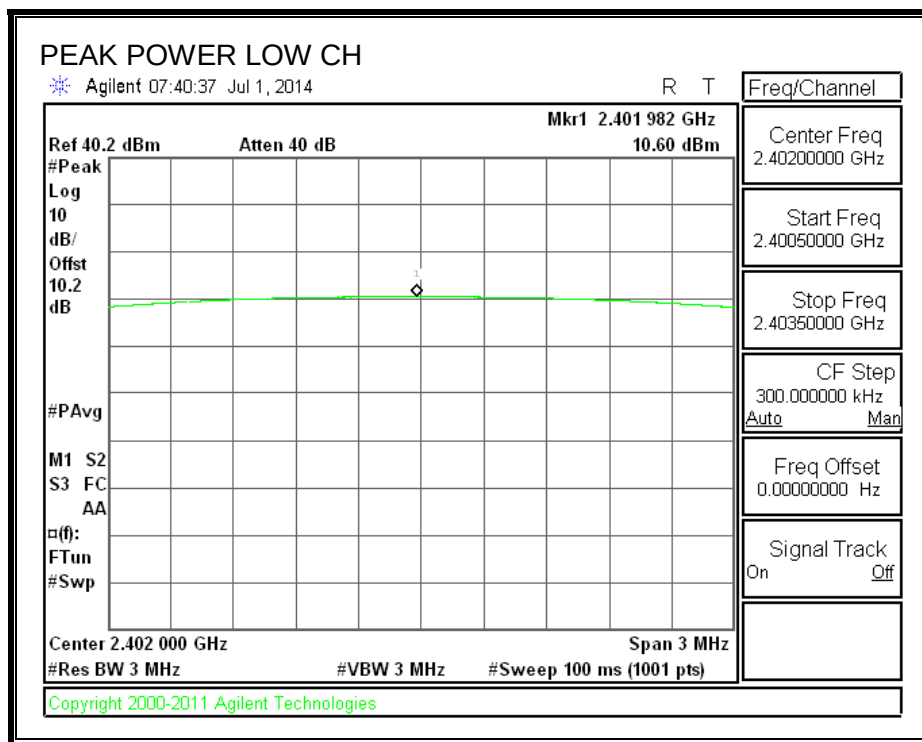
8.5.1. BASIC DATA RATE GFSK MODULATION

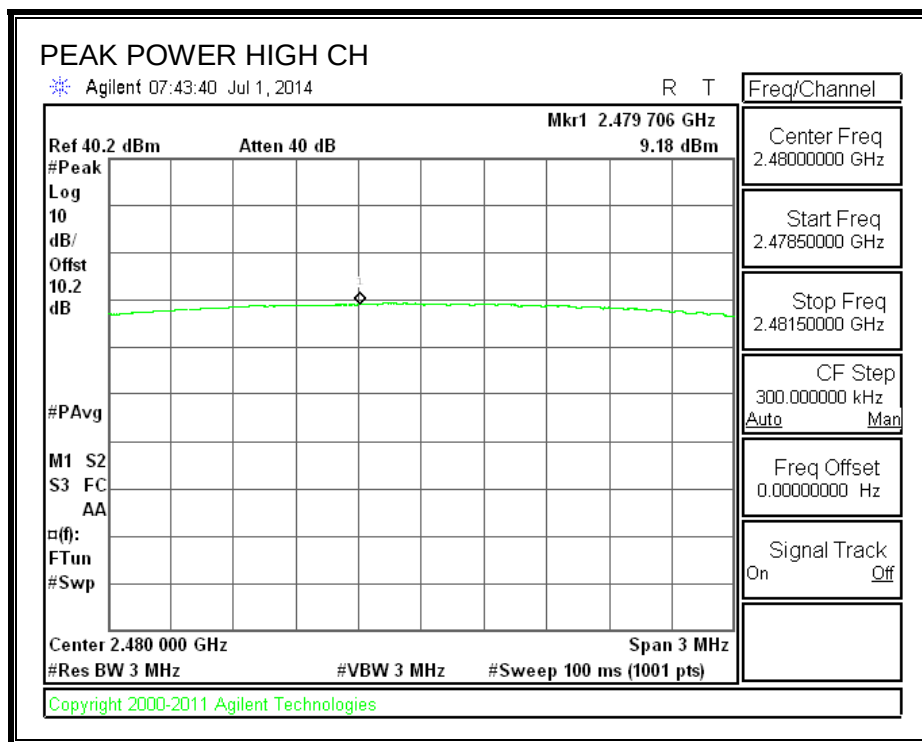
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.60	21	-10.40
Middle	2441	11.19	21	-9.81
High	2480	9.18	21	-11.82
Worst		11.19		-9.81

8.5.2. ENHANCED DATA RATE 8PSK MODULATION

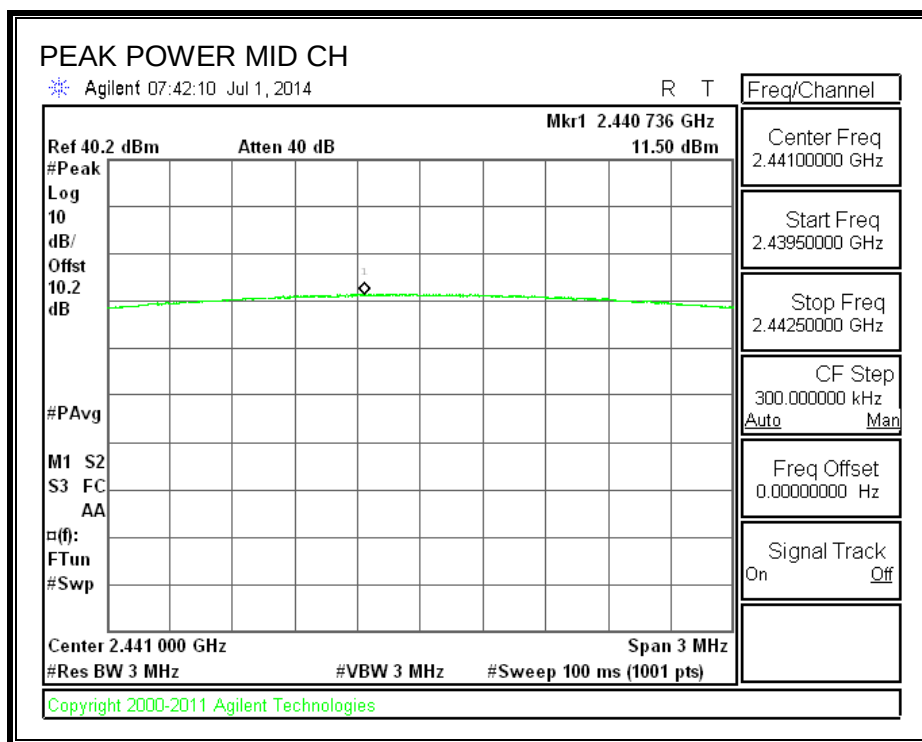
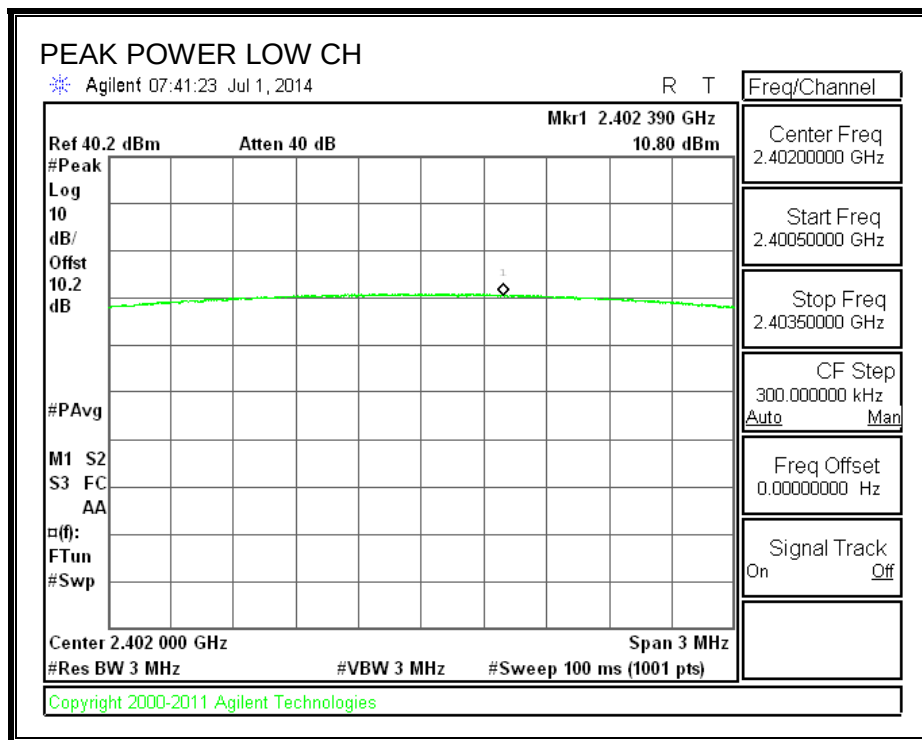
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.80	21	-10.20
Middle	2441	11.50	21	-9.50
High	2480	9.49	21	-11.51
Worst		11.50		-9.50

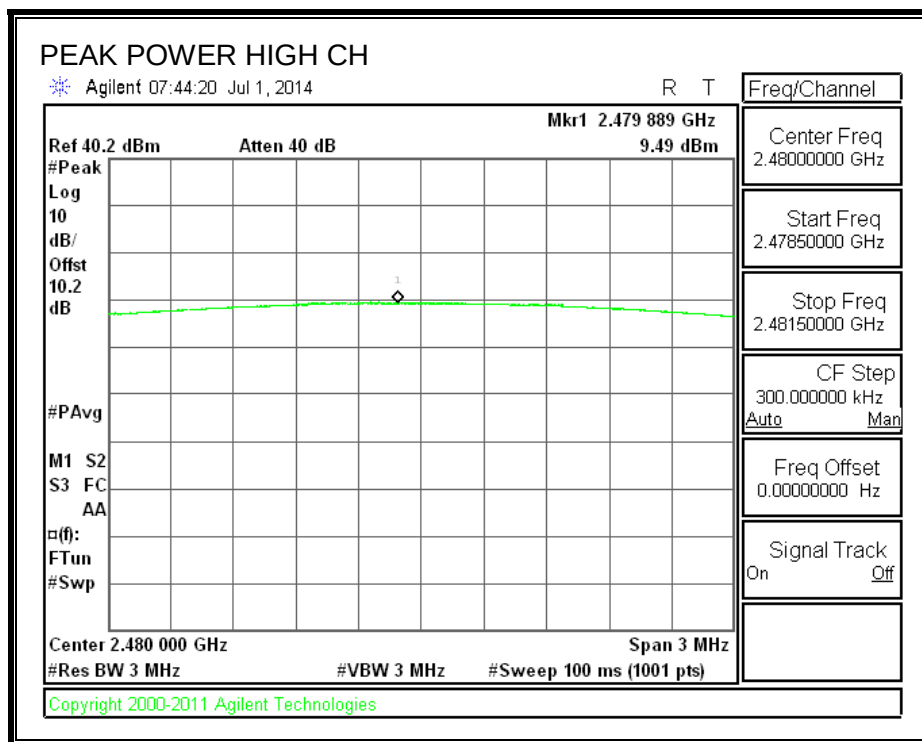
GFSK OUTPUT POWER





8PSK OUTPUT POWER





8.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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

RESULTS

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

8.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.40
Middle	2441	10.40
High	2480	8.60
Worst		10.40

8.6.2. DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.20
Middle	2441	7.80
High	2480	6.00
Worst		7.80

8.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.30
Middle	2441	7.90
High	2480	6.40
Worst		7.90

8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

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

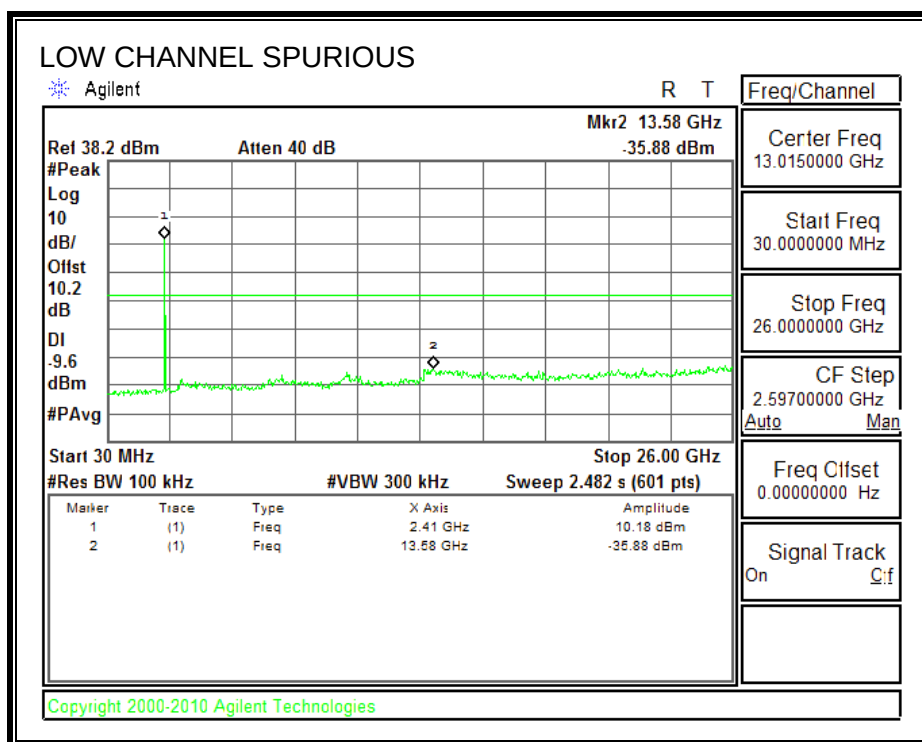
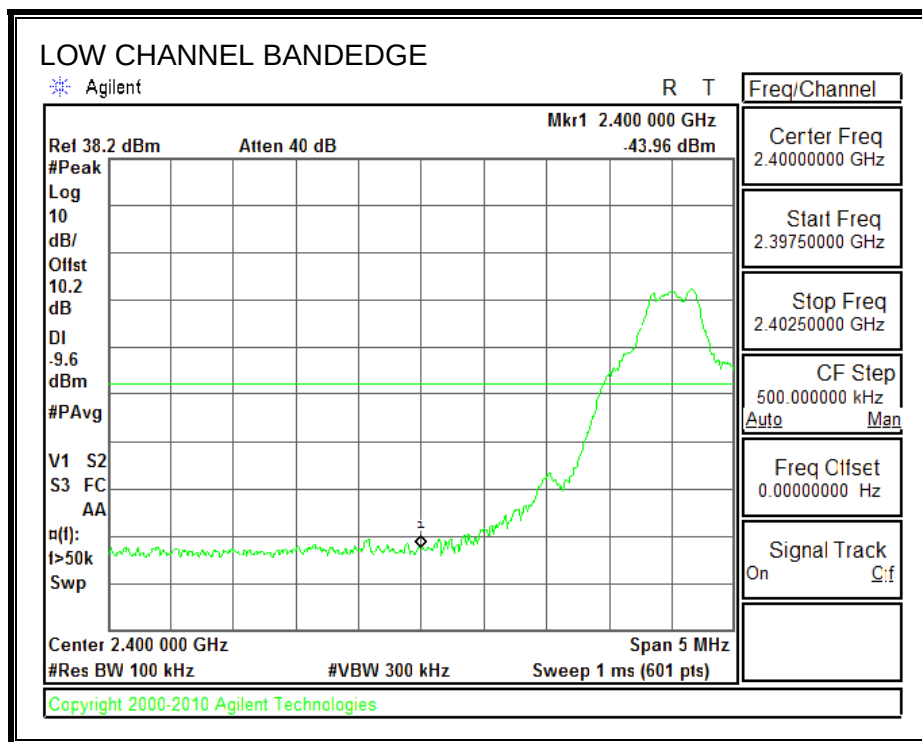
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

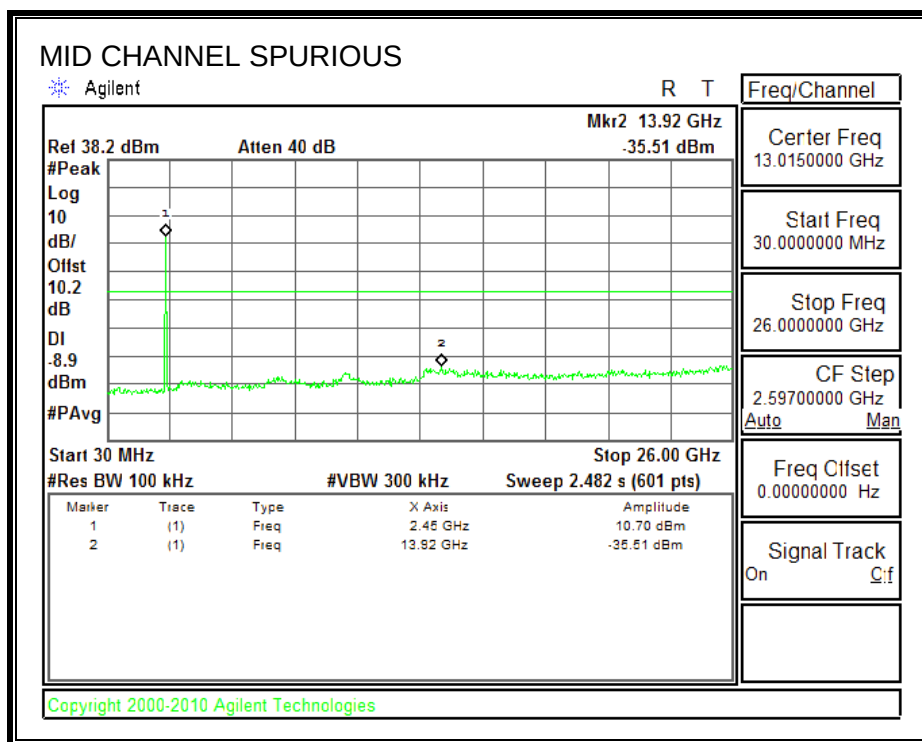
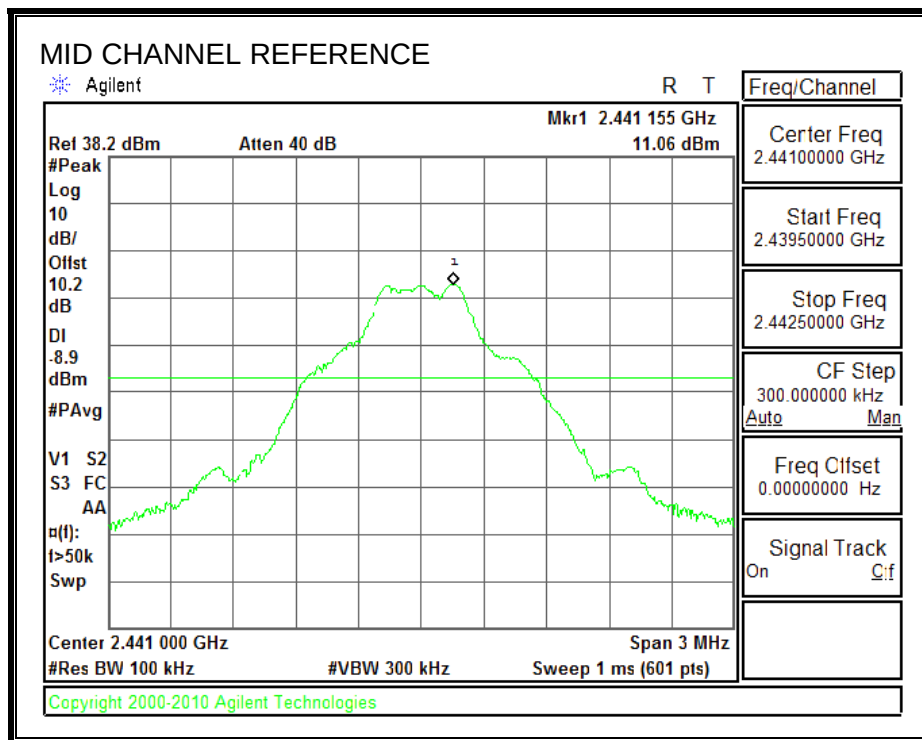
RESULTS

8.7.1. BASIC DATA RATE GFSK MODULATION

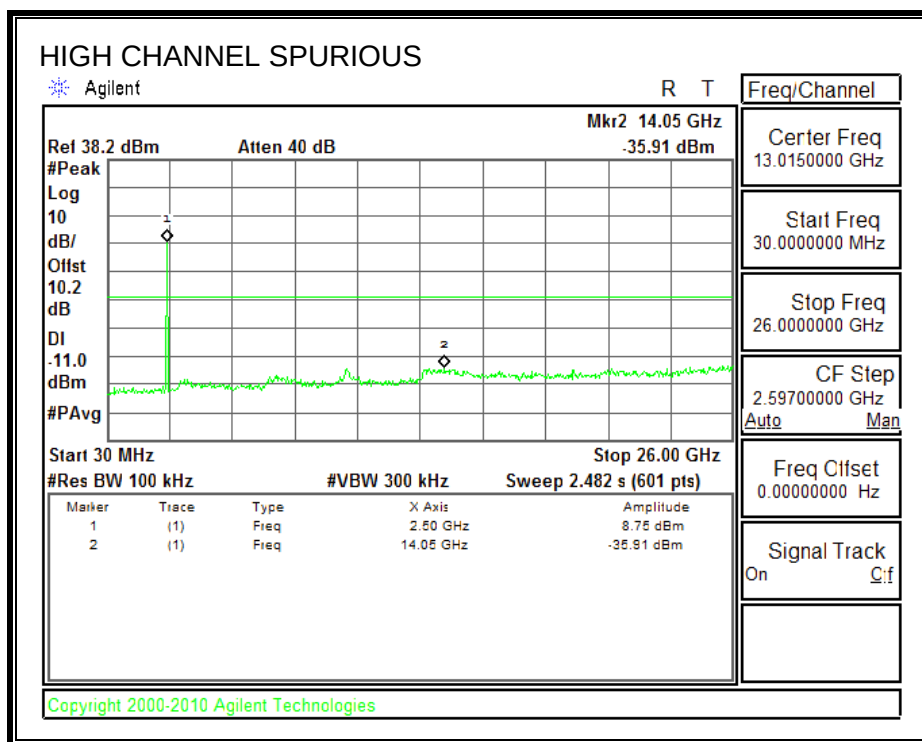
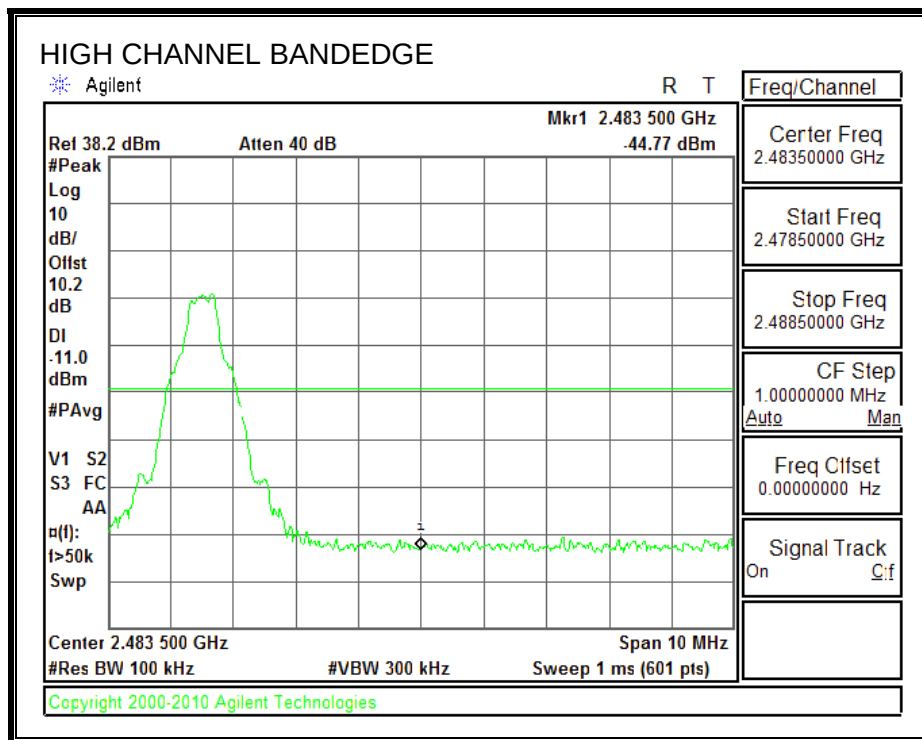
SPURIOUS EMISSIONS, LOW CHANNEL



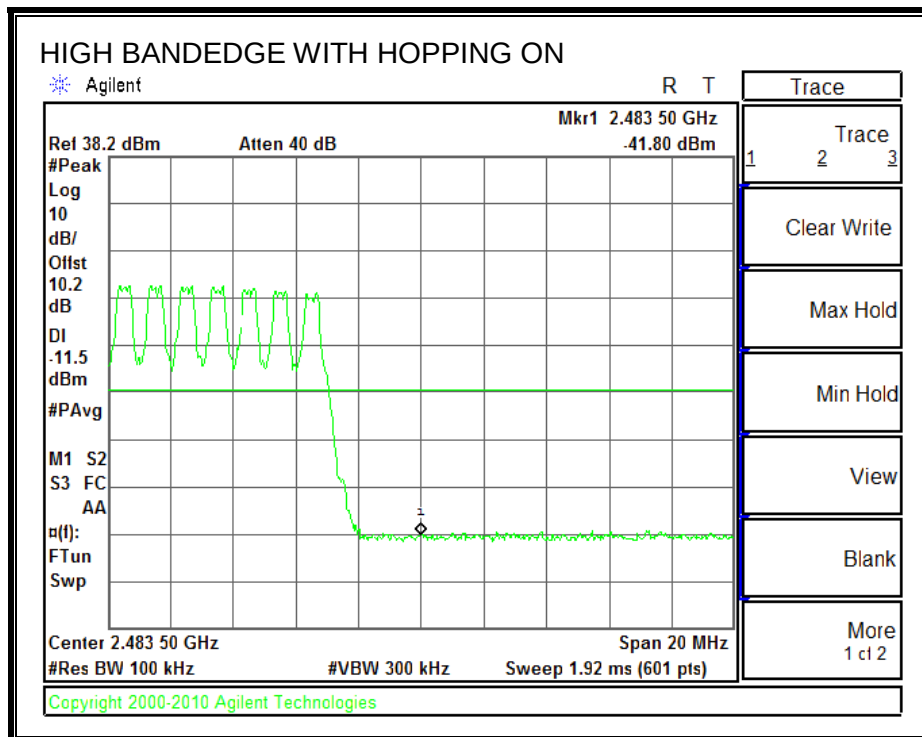
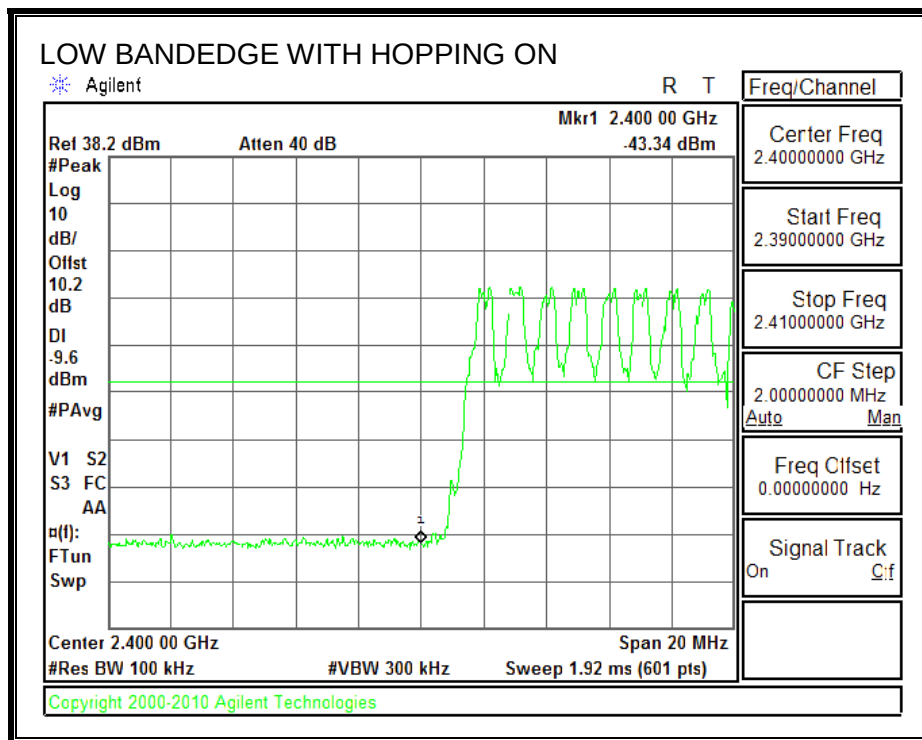
SPURIOUS EMISSIONS, MID CHANNEL



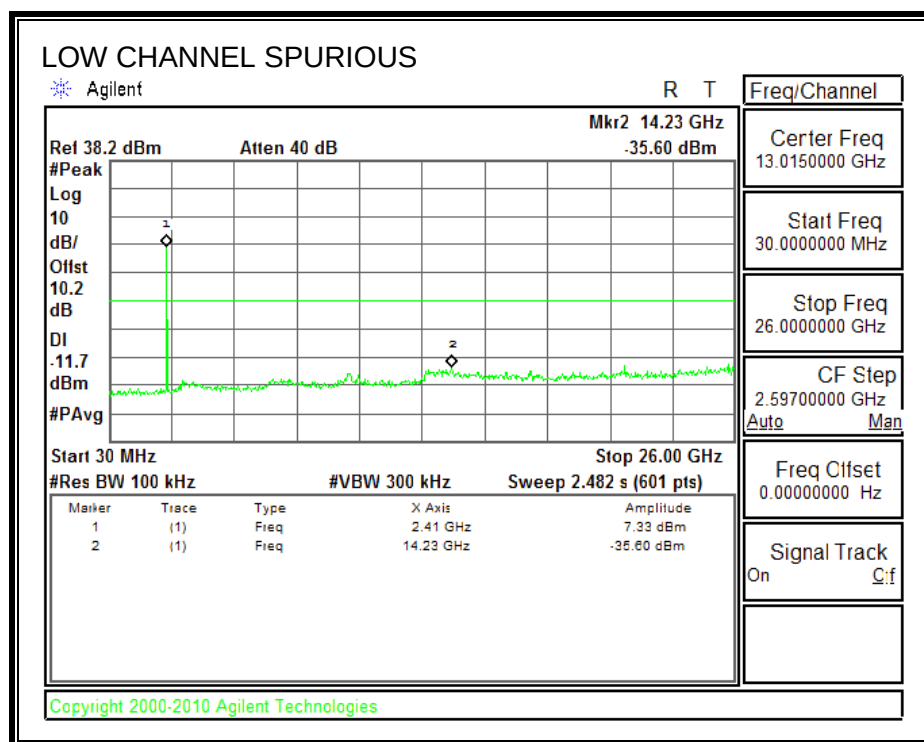
SPURIOUS EMISSIONS, HIGH CHANNEL



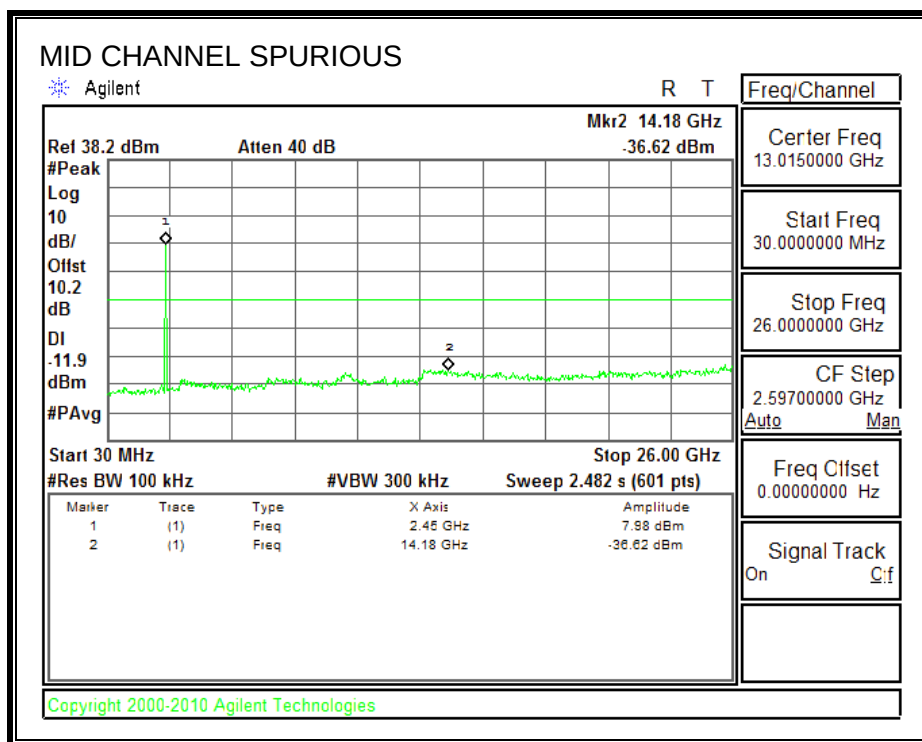
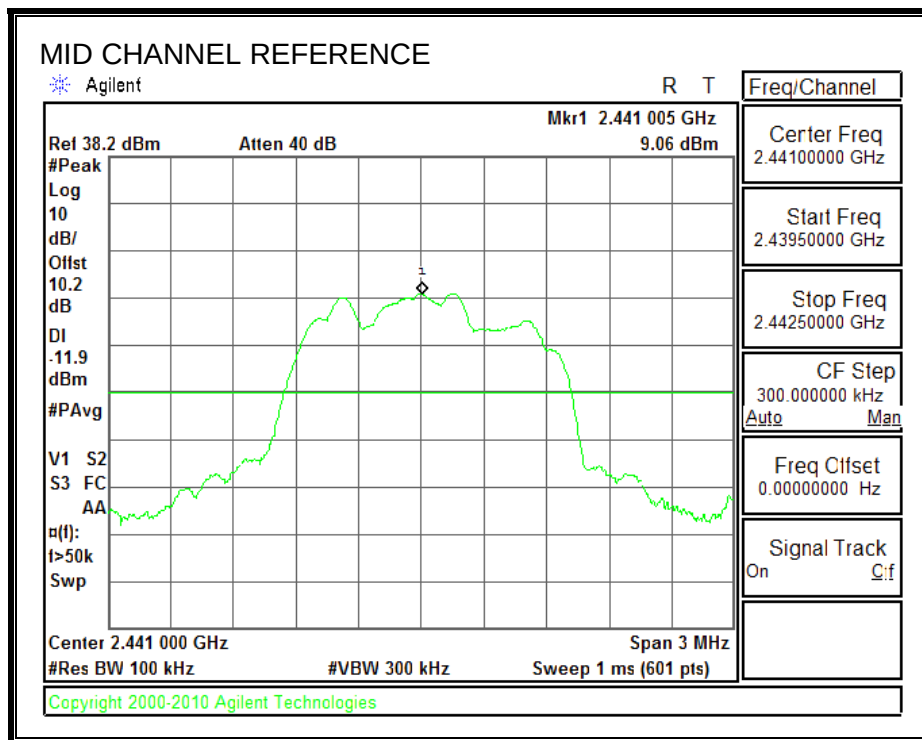
SPURIOUS BANDEDGE EMISSIONS WITH GFSK HOPPING ON



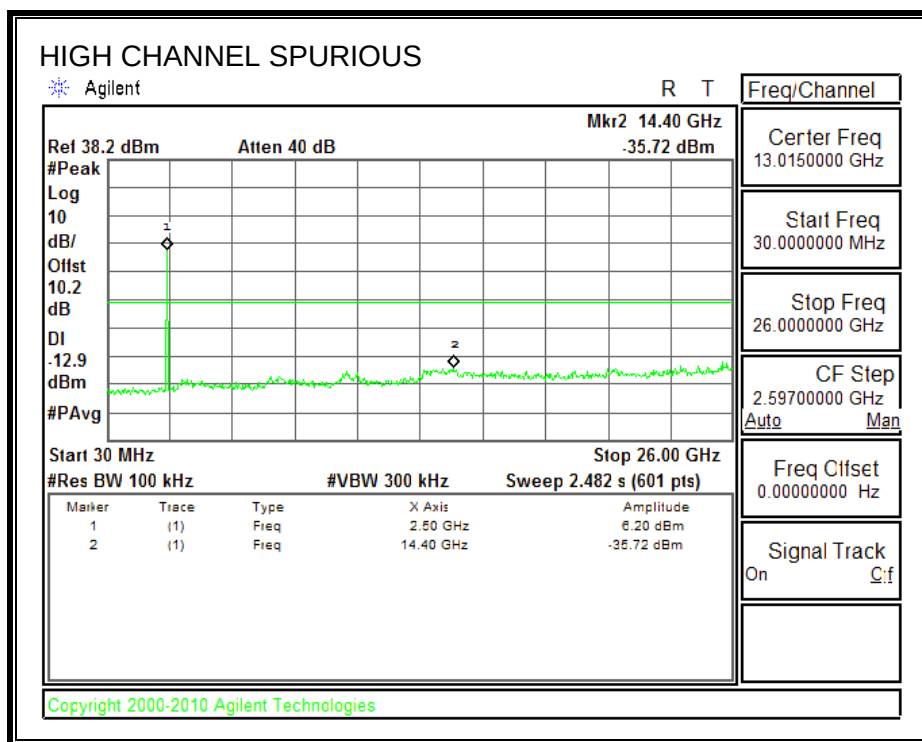
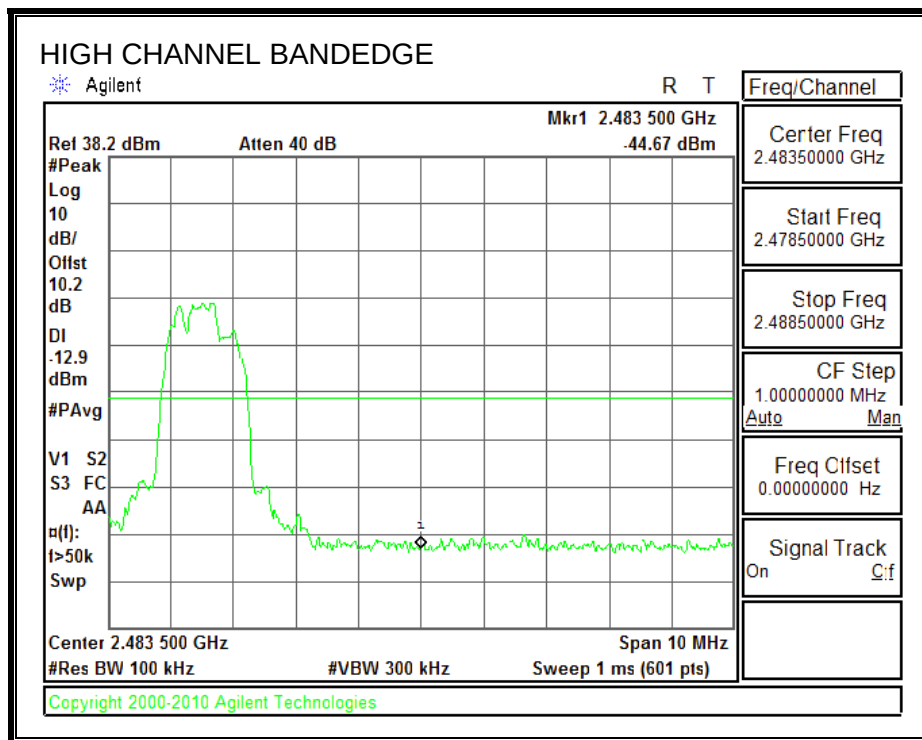
SPURIOUS EMISSIONS, LOW CHANNEL



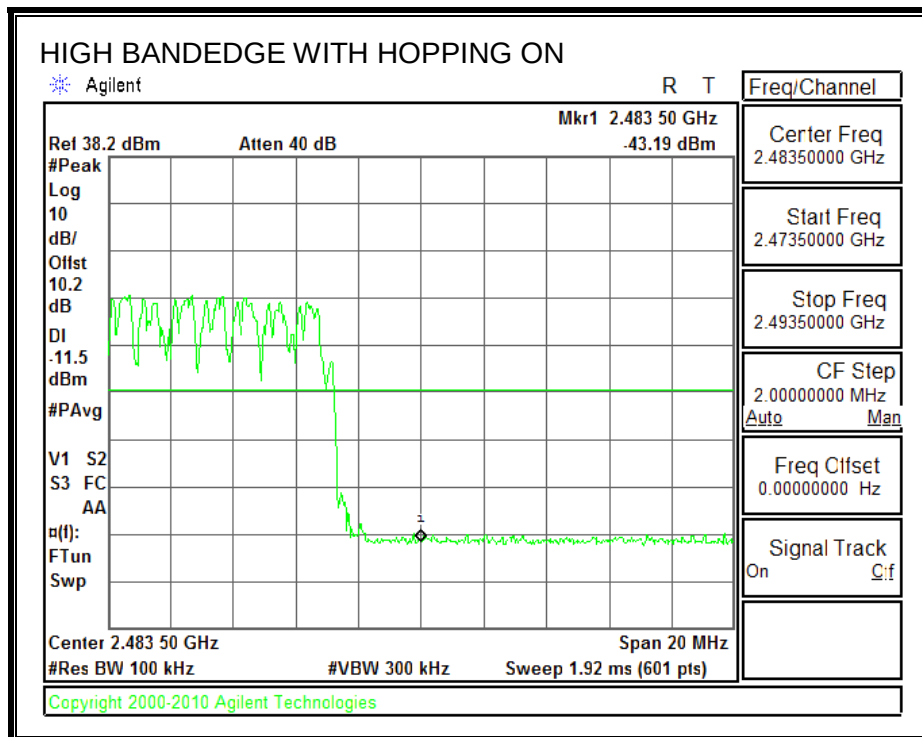
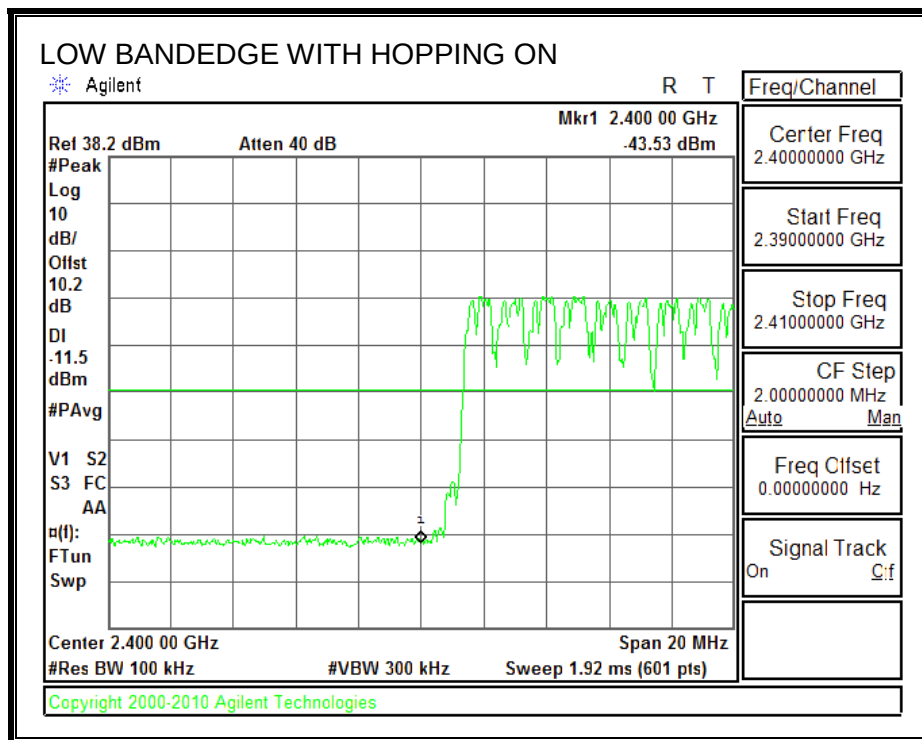
SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



SPURIOUS BANDEDGE EMISSIONS WITH 8PSK HOPPING ON



9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 1/T (on time) for average measurement. $GFSK = 1/T = 1 / 0.00288S = 360Hz$.

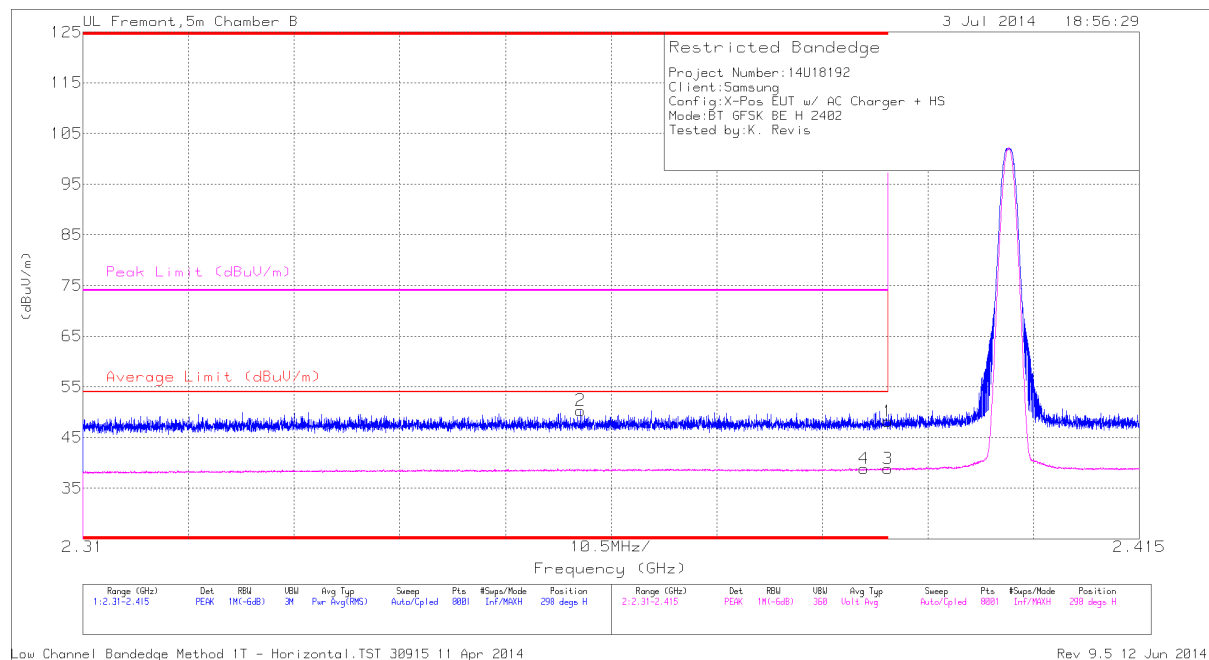
The spectrum from 1GHzHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



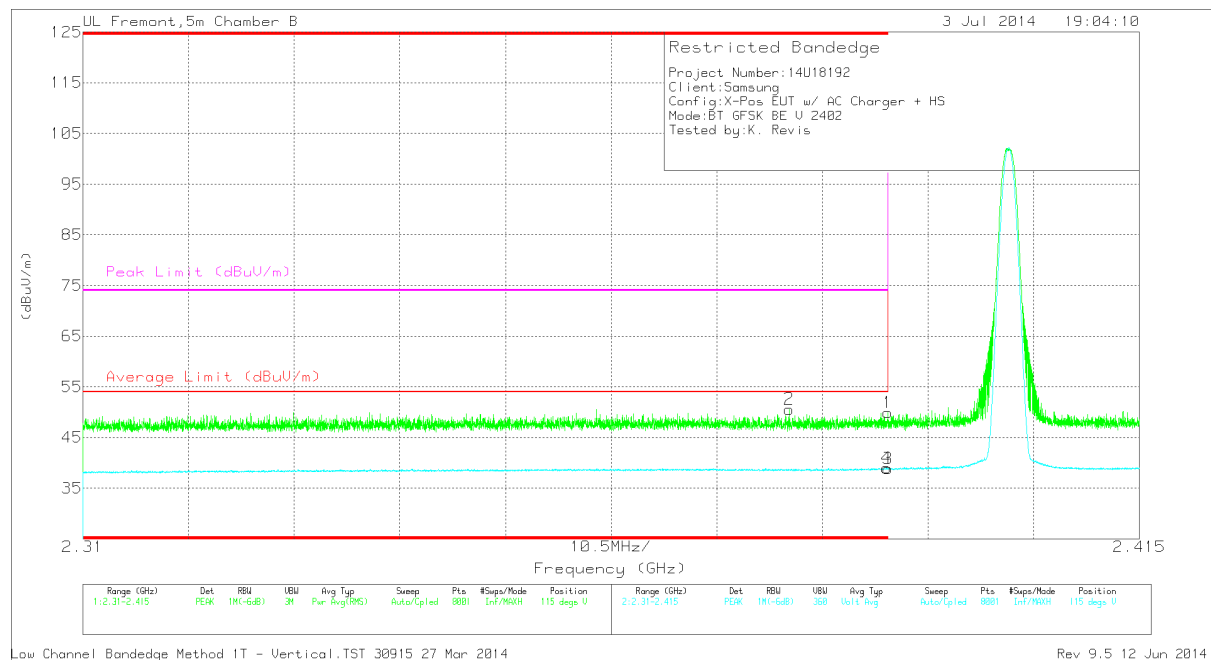
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.84	PK	32.1	-22.8	0	48.14	-	-	74	-25.86	298	281	H
2	* 2.359	41.25	PK	31.9	-22.8	0	50.35	-	-	74	-23.65	298	281	H
3	* 2.39	29.52	VB1T	32.1	-22.8	0	38.82	54	-15.18	-	-	298	281	H
4	* 2.388	29.6	VB1T	32.1	-22.8	0	38.9	54	-15.1	-	-	298	281	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



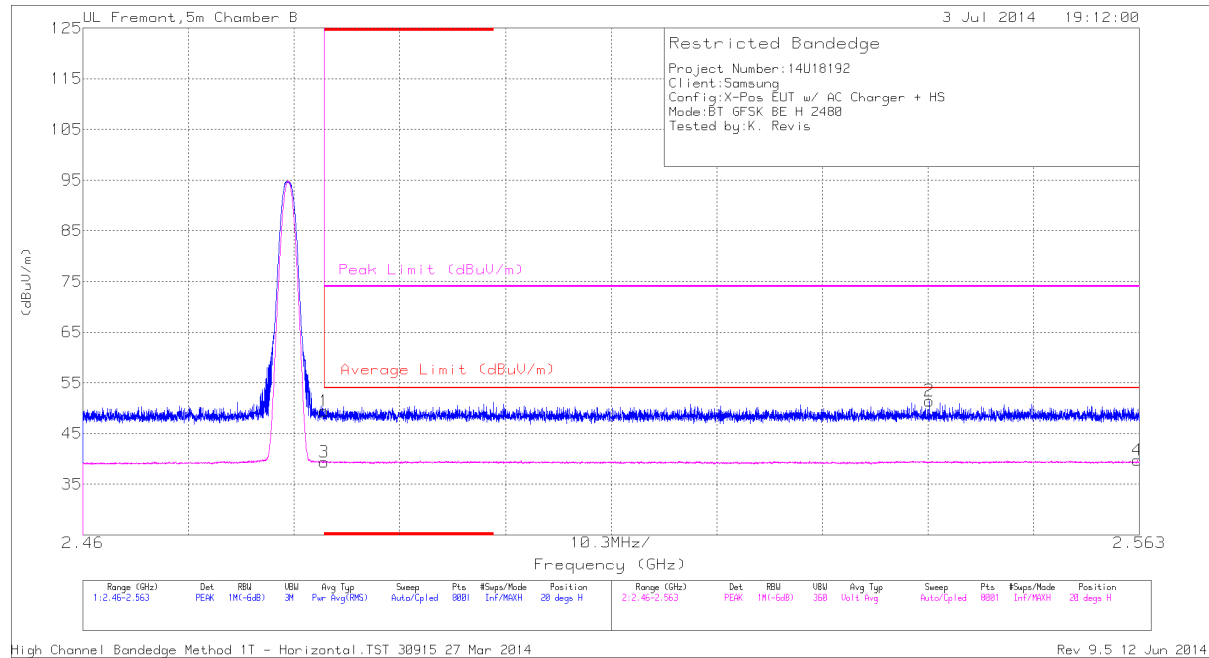
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AFT345 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.59	PK	32.1	-22.8	0	49.89	-	-	74	-24.11	115	298	V
2	* 2.38	41.5	PK	32	-22.9	0	50.6	-	-	74	-23.4	115	298	V
3	* 2.39	29.58	VB1T	32.1	-22.8	0	38.88	54	-15.12	-	-	115	298	V
4	* 2.39	29.67	VB1T	32.1	-22.8	0	38.97	54	-15.03	-	-	115	298	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



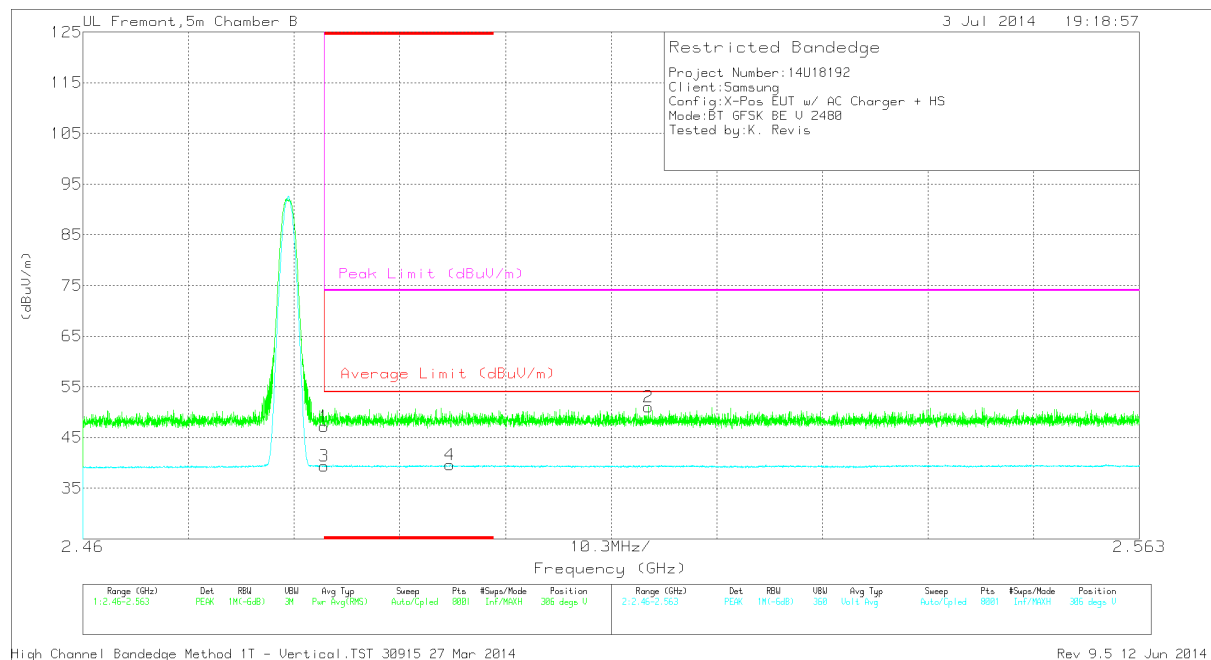
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.77	PK	32.4	-22.7	0	49.47	-	-	74	-24.53	20	235	H
3	* 2.484	29.63	VB1T	32.4	-22.7	0	39.33	54	-14.67	-	-	20	235	H
2	2.543	41.57	PK	32.5	-22.6	0	51.47	-	-	74	-22.53	20	235	H
4	2.563	29.93	VB1T	32.5	-22.7	0	39.73	54	-14.27	-	-	20	235	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (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	37.47	PK	32.4	-22.7	0	47.17	-	-	74	-26.83	306	275	V
3	* 2.484	29.66	VB1T	32.4	-22.7	0	39.36	54	-14.64	-	-	306	275	V
4	* 2.496	29.93	VB1T	32.4	-22.7	0	39.63	54	-14.37	-	-	306	275	V
2	2.515	41.23	PK	32.5	-22.7	0	51.03	-	-	74	-22.97	306	275	V

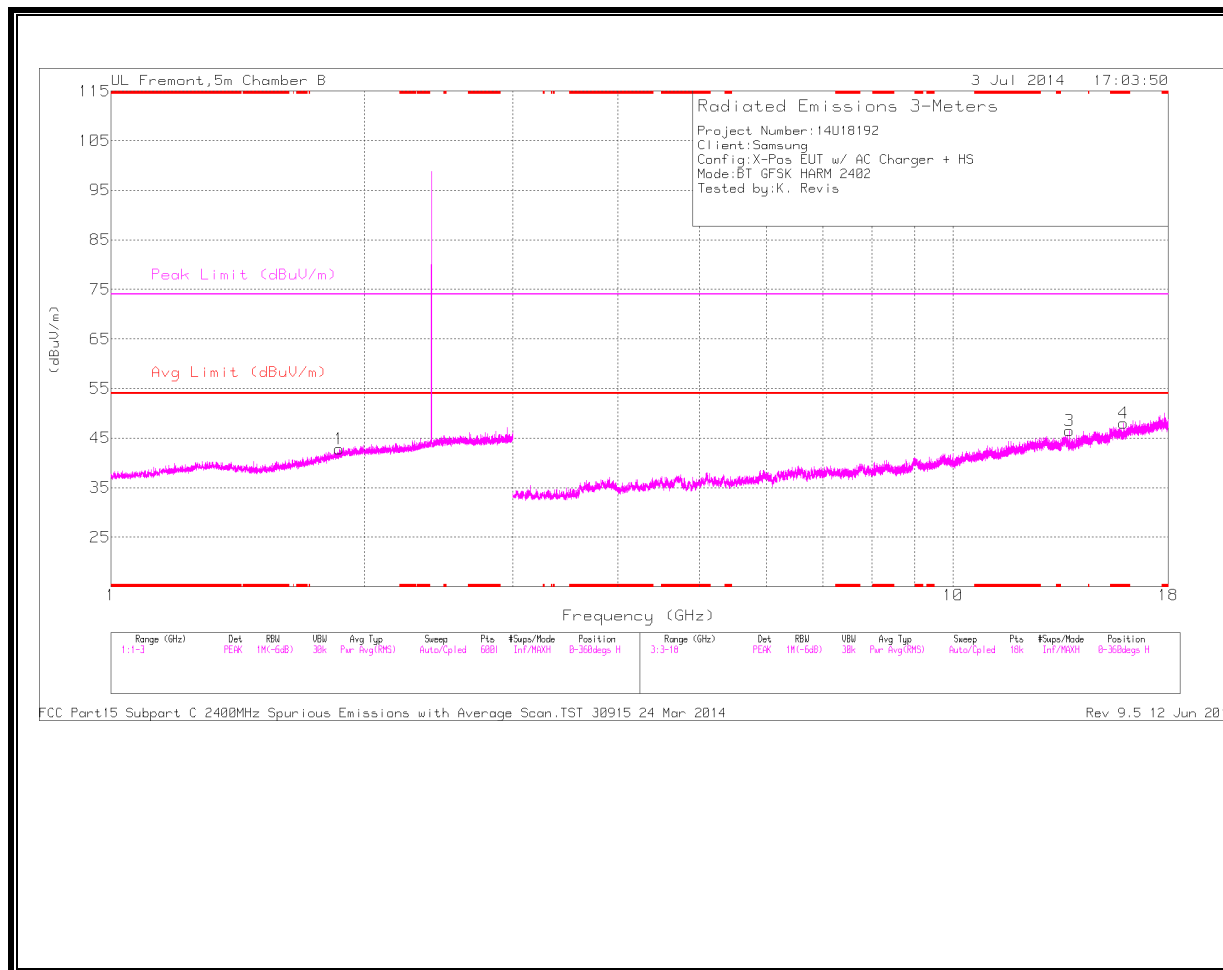
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

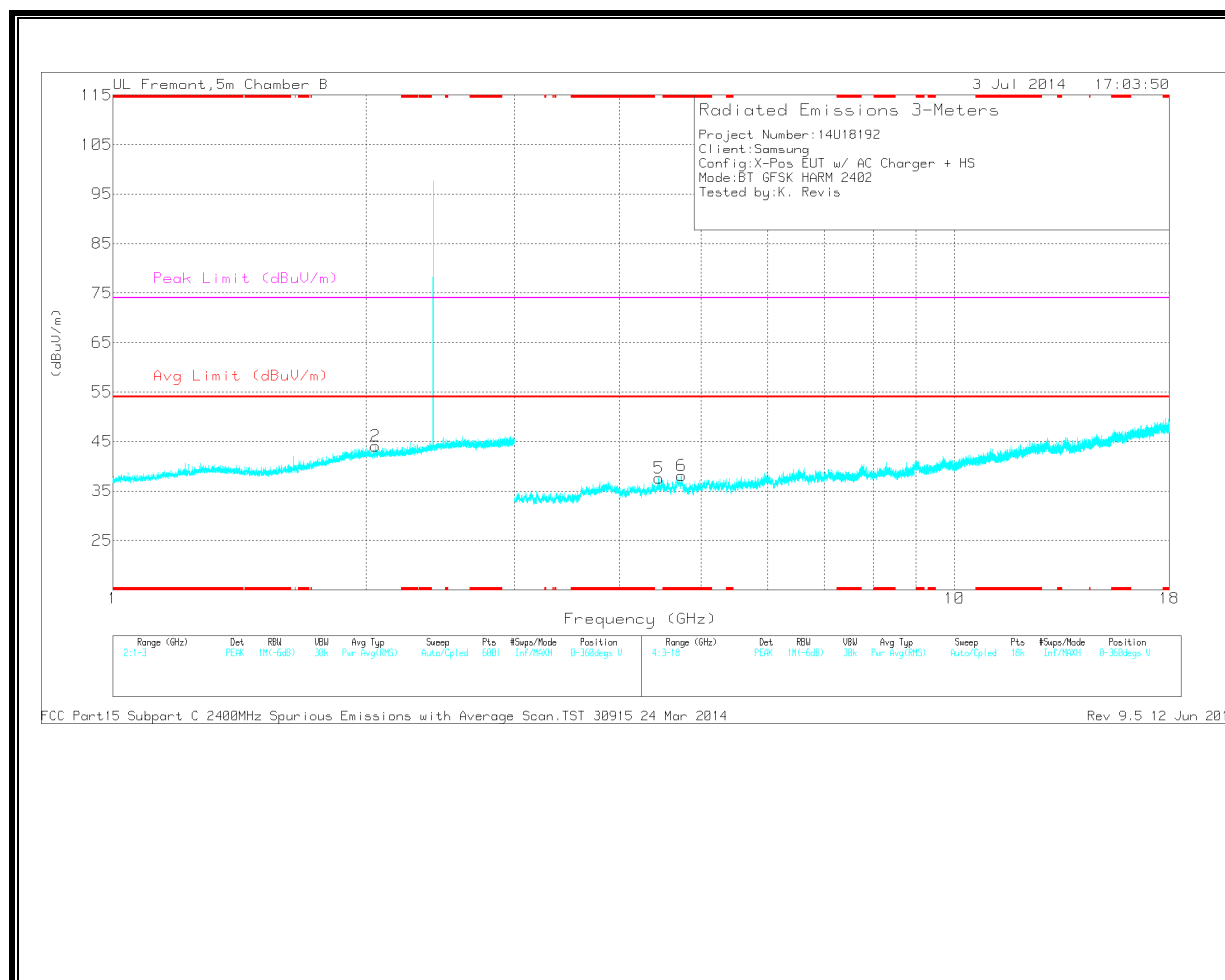
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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

VERTICAL



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

LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 15.915	26.97	PK	40.8	-19.8	0	47.97	-	-	74	-26.03	0-360	208	H
6	* 4.741	33.31	PK	34.2	-29.4	0	38.11	-	-	74	-35.89	0-360	194	V
1	1.866	35.59	PK	30.8	-23.6	0	42.79	-	-	-	-	0-360	206	H
2	2.053	36.2	PK	31.3	-23.4	0	44.1	-	-	-	-	0-360	99	V
5	4.451	32.91	PK	33.9	-29.2	0	37.61	-	-	-	-	0-360	99	V
3	13.728	29.1	PK	38.6	-21.2	0	46.5	-	-	-	-	0-360	208	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

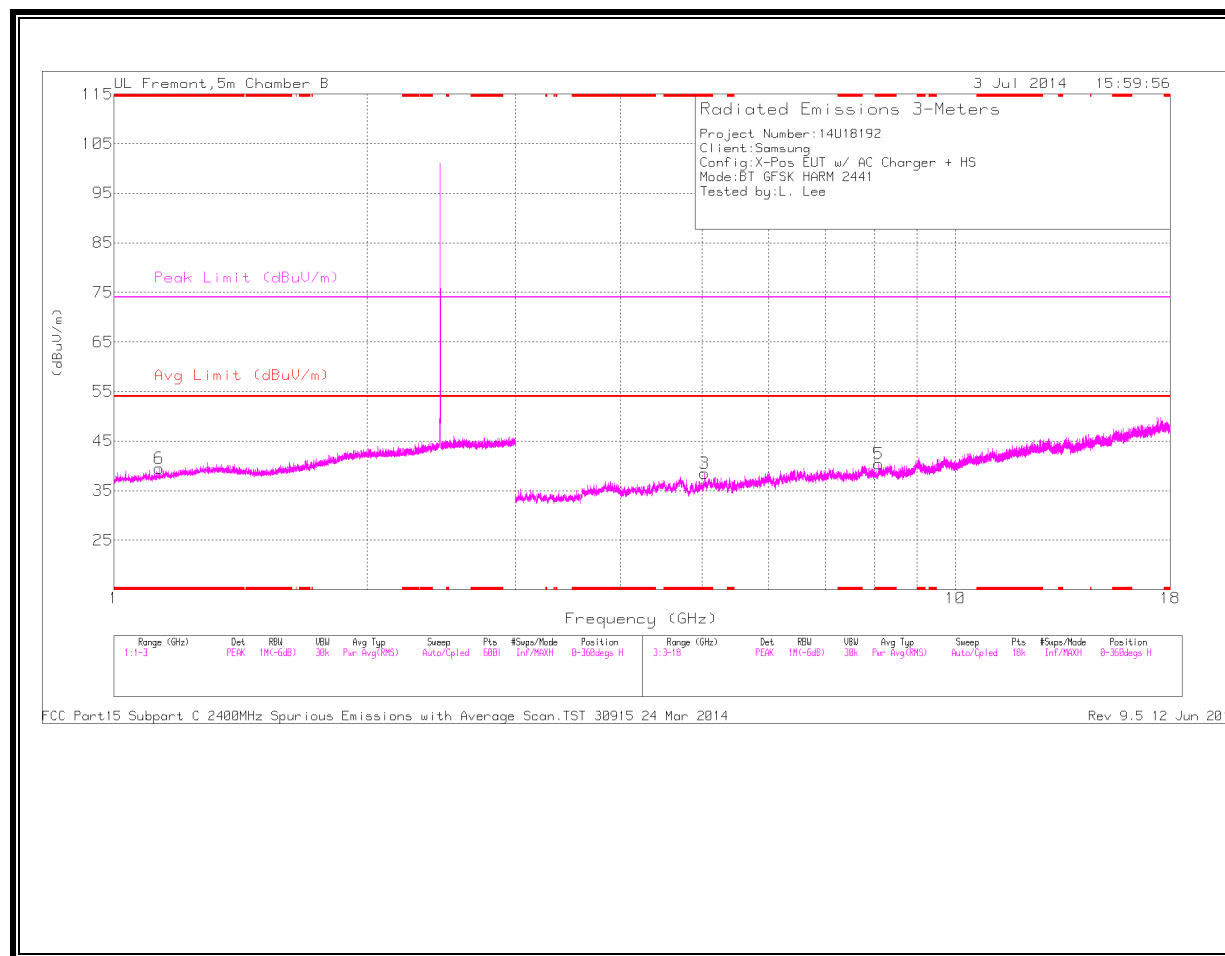
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 15.916	32.93	PK3	40.8	-19.8	0	53.93	-	-	74	-20.07	359	217	H
* 15.913	21.05	VB1T	40.8	-19.8	0	42.05	54	-11.95	-	-	359	217	H
* 4.741	40.59	PK3	34.2	-29.4	0	45.39	-	-	74	-28.61	359	187	V
* 4.743	28.68	VB1T	34.2	-29.3	0	33.58	54	-20.42	-	-	359	187	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

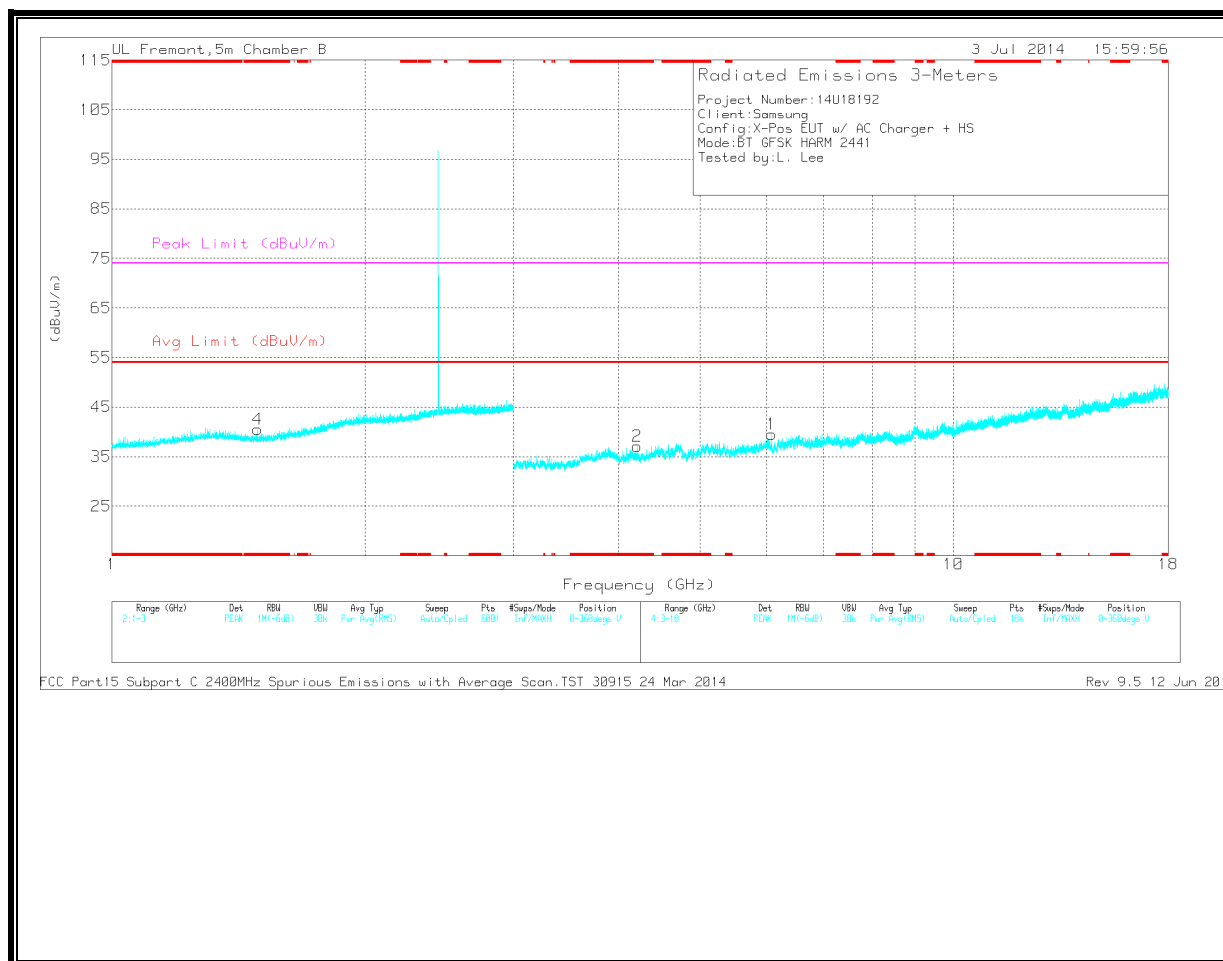
PK3 - FHSS Method: Maximum Peak

MID CHANNEL
HORIZONTAL



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

VERTICAL



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

MID CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	* 1.132	36.66	PK	27.6	-24.7	39.56	-	-	74	-34.44	0-360	206	H
4	* 1.49	36.71	PK	28	-24.2	40.51	-	-	74	-33.49	0-360	196	V
3	* 5.034	33.38	PK	34.2	-29.1	38.48	-	-	74	-35.52	0-360	99	H
5	* 8.101	30.68	PK	35.7	-26	40.38	-	-	74	-33.62	0-360	99	H
2	* 4.207	33.52	PK	33.6	-30	37.12	-	-	74	-36.88	0-360	196	V
1	6.083	33.97	PK	35.3	-29.8	39.47	-	-	-	-	0-360	99	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

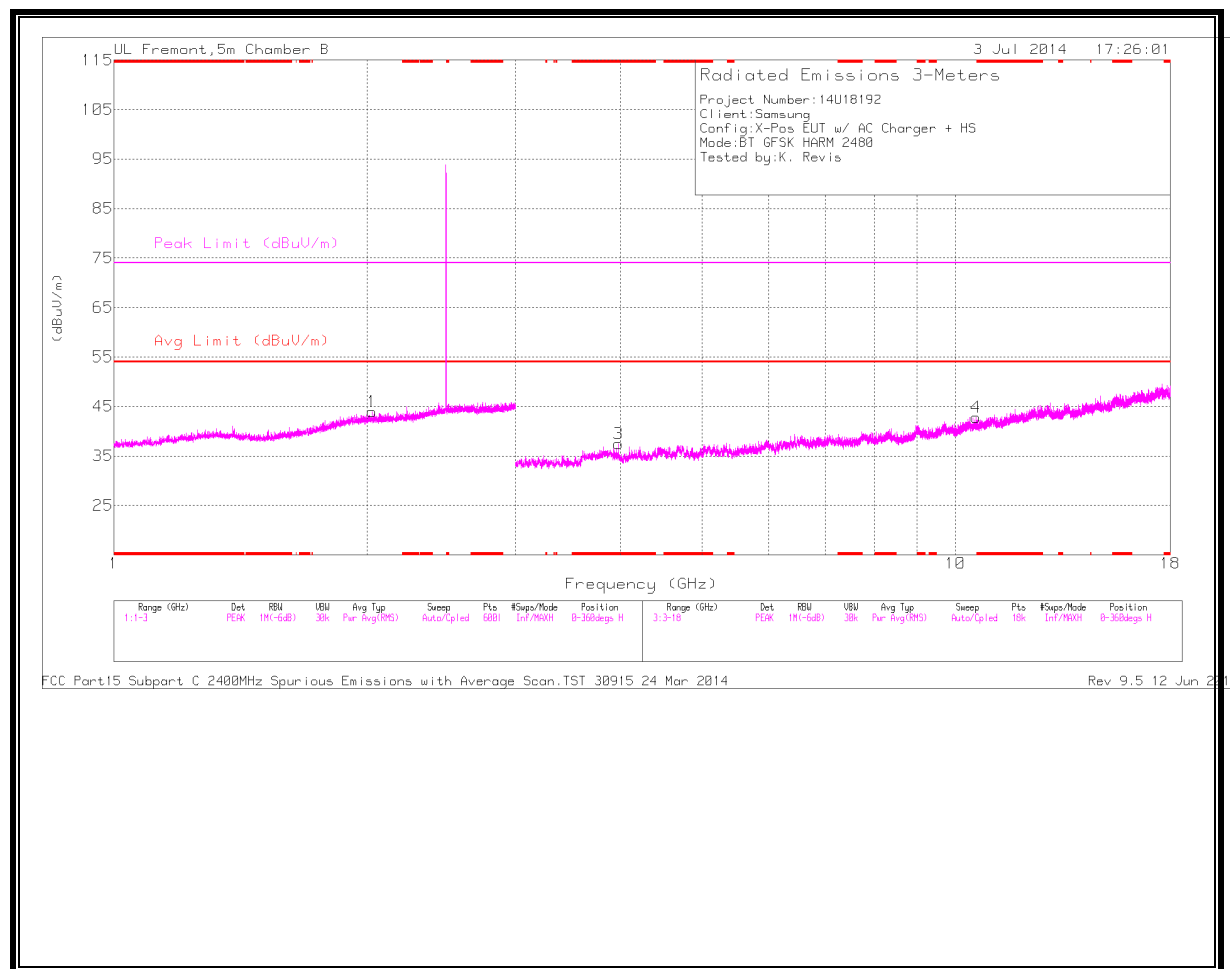
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/F ltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6.081	40.02	PK3	35.3	-29.8	45.52	-	-	-	-	334	180	V
6.083	27.56	VB1T	35.3	-29.8	33.06	-	-	-	-	334	180	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

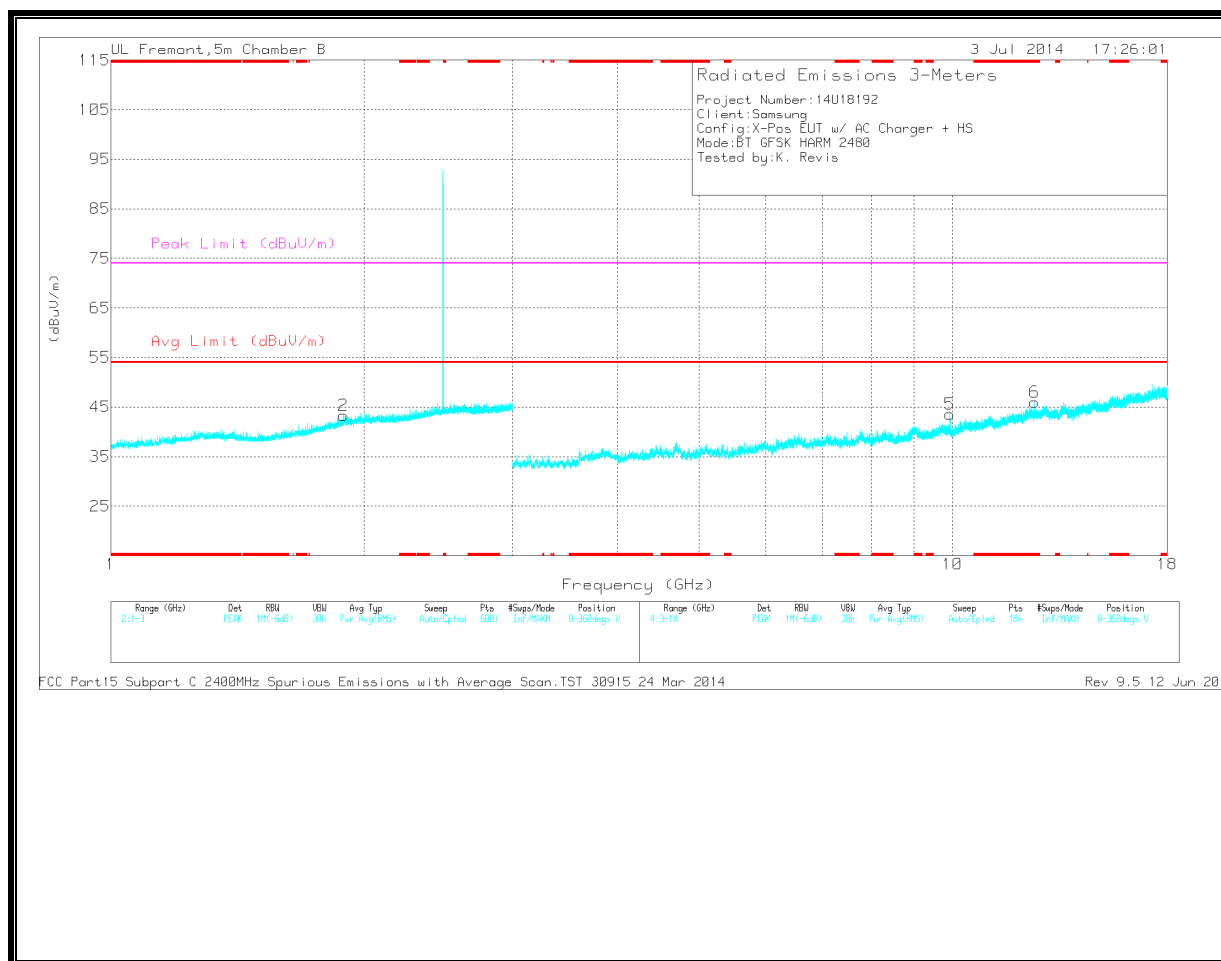
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HIGH CHANNEL
HORIZONTAL



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

VERTICAL



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

HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 3.977	34.76	PK	33.6	-30.9	0	37.46	-	-	74	-36.54	0-360	195	H
6	* 12.514	28.31	PK	39	-21.3	0	46.01	-	-	74	-27.99	0-360	99	V
2	1.89	35.72	PK	31	-23.4	0	43.32	-	-	-	-	0-360	206	V
1	2.027	36.01	PK	31.3	-23.4	0	43.91	-	-	-	-	0-360	208	H
5	9.92	30.09	PK	37	-23.5	0	43.59	-	-	-	-	0-360	206	V
4	10.575	28.15	PK	37.6	-22.9	0	42.85	-	-	-	-	0-360	99	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

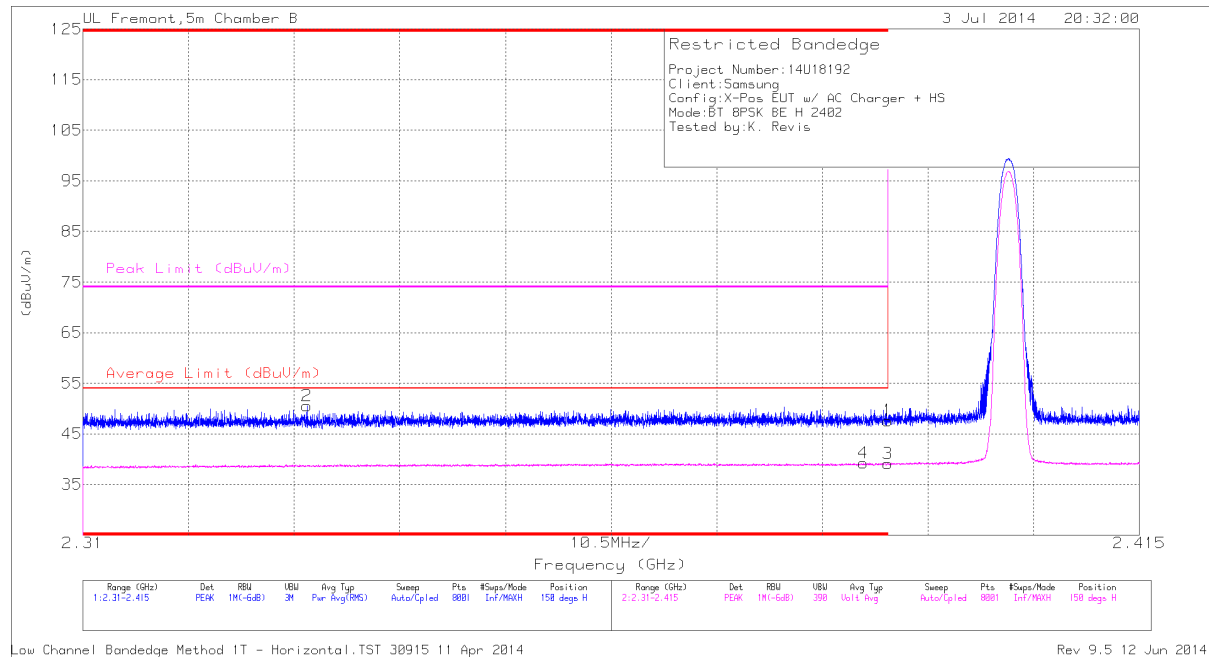
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.977	41.21	PK3	33.6	-30.9	0	43.91	-	-	74	-30.09	359	202	H
* 12.512	34.49	PK3	39	-21.4	0	52.09	-	-	74	-21.91	359	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

9.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



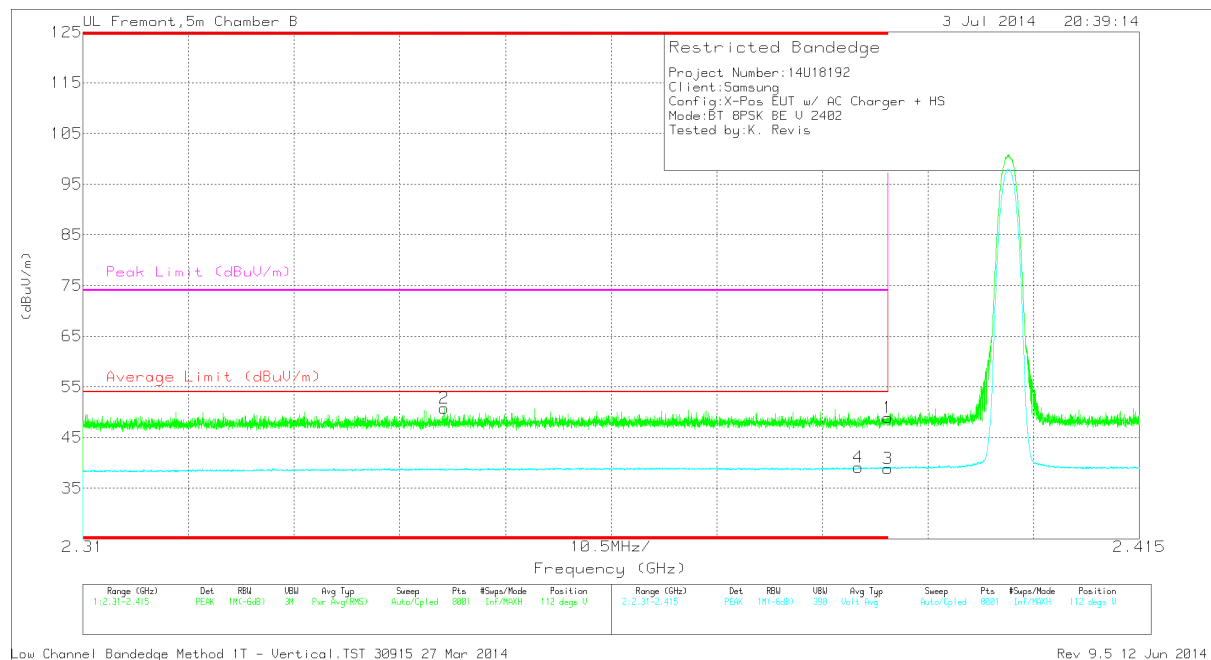
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.32	PK	32.1	-22.8	0	47.62	-	-	74	-26.38	150	294	H
2	* 2.332	41.66	PK	31.8	-22.9	0	50.56	-	-	74	-23.44	150	294	H
3	* 2.39	29.77	VB1T	32.1	-22.8	0	39.07	54	-14.93	-	-	150	294	H
4	* 2.388	29.93	VB1T	32.1	-22.8	0	39.23	54	-14.77	-	-	150	294	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



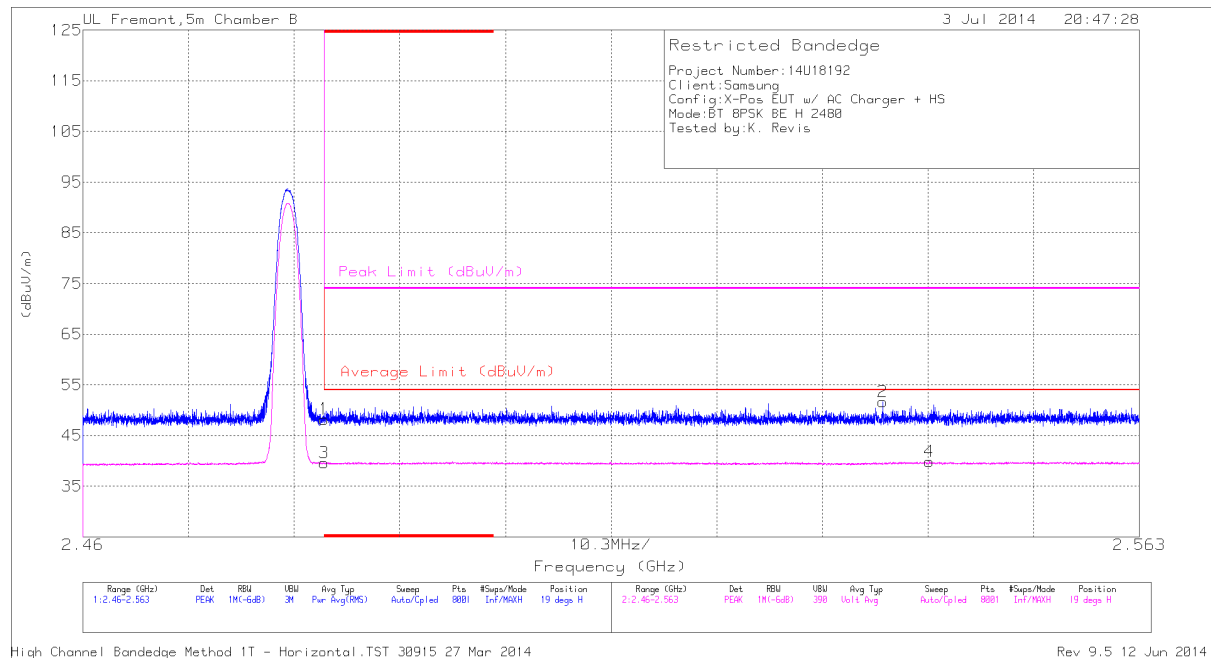
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	39.61	PK	32.1	-22.8	0	48.91	-	-	74	-25.09	112	298	V
2	* 2.346	41.82	PK	31.9	-22.9	0	50.82	-	-	74	-23.18	112	298	V
3	* 2.39	29.62	VB1T	32.1	-22.8	0	38.92	54	-15.08	-	-	112	298	V
4	* 2.387	29.83	VB1T	32.1	-22.8	0	39.13	54	-14.87	-	-	112	298	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



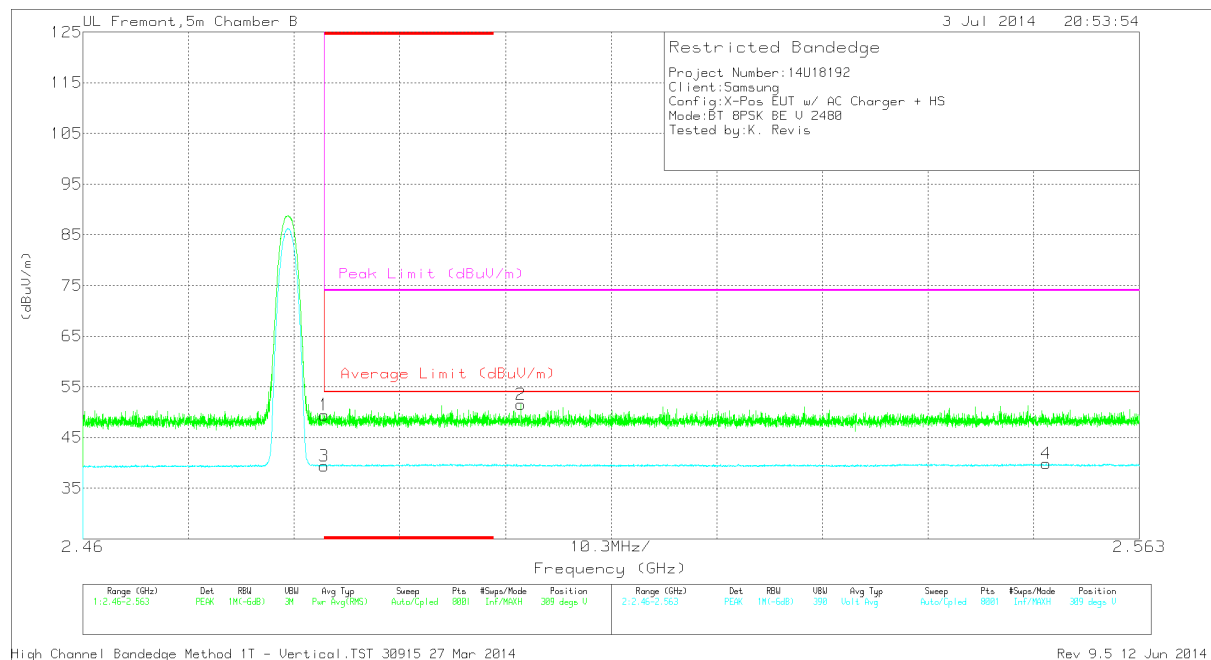
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	38.54	PK	32.4	-22.7	0	48.24	-	-	74	-25.76	19	235	H
3	* 2.484	29.87	VB1T	32.4	-22.7	0	39.57	54	-14.43	-	-	19	235	H
2	2.538	41.81	PK	32.5	-22.6	0	51.71	-	-	74	-22.29	19	235	H
4	2.543	30	VB1T	32.5	-22.6	0	39.9	54	-14.1	-	-	19	235	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filt r/Pad (dB)	DC Corr (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	39.78	PK	32.4	-22.7	0	49.48	-	-	74	-24.52	309	337	V
3	* 2.484	29.72	VB1T	32.4	-22.7	0	39.42	54	-14.58	-	-	309	337	V
2	2.503	41.78	PK	32.4	-22.7	0	51.48	-	-	74	-22.52	309	337	V
4	2.554	29.93	VB1T	32.5	-22.6	0	39.83	54	-14.17	-	-	309	337	V

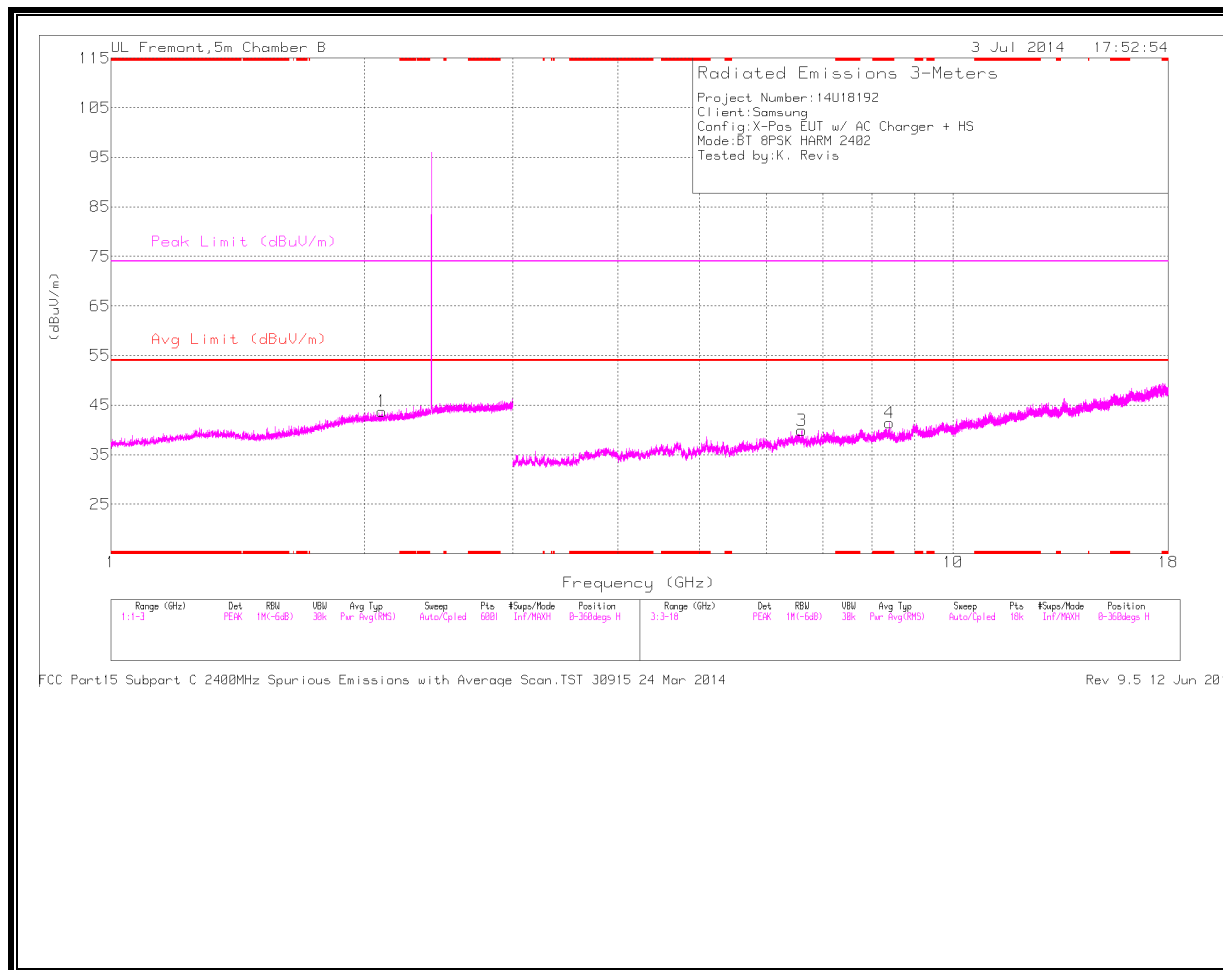
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

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

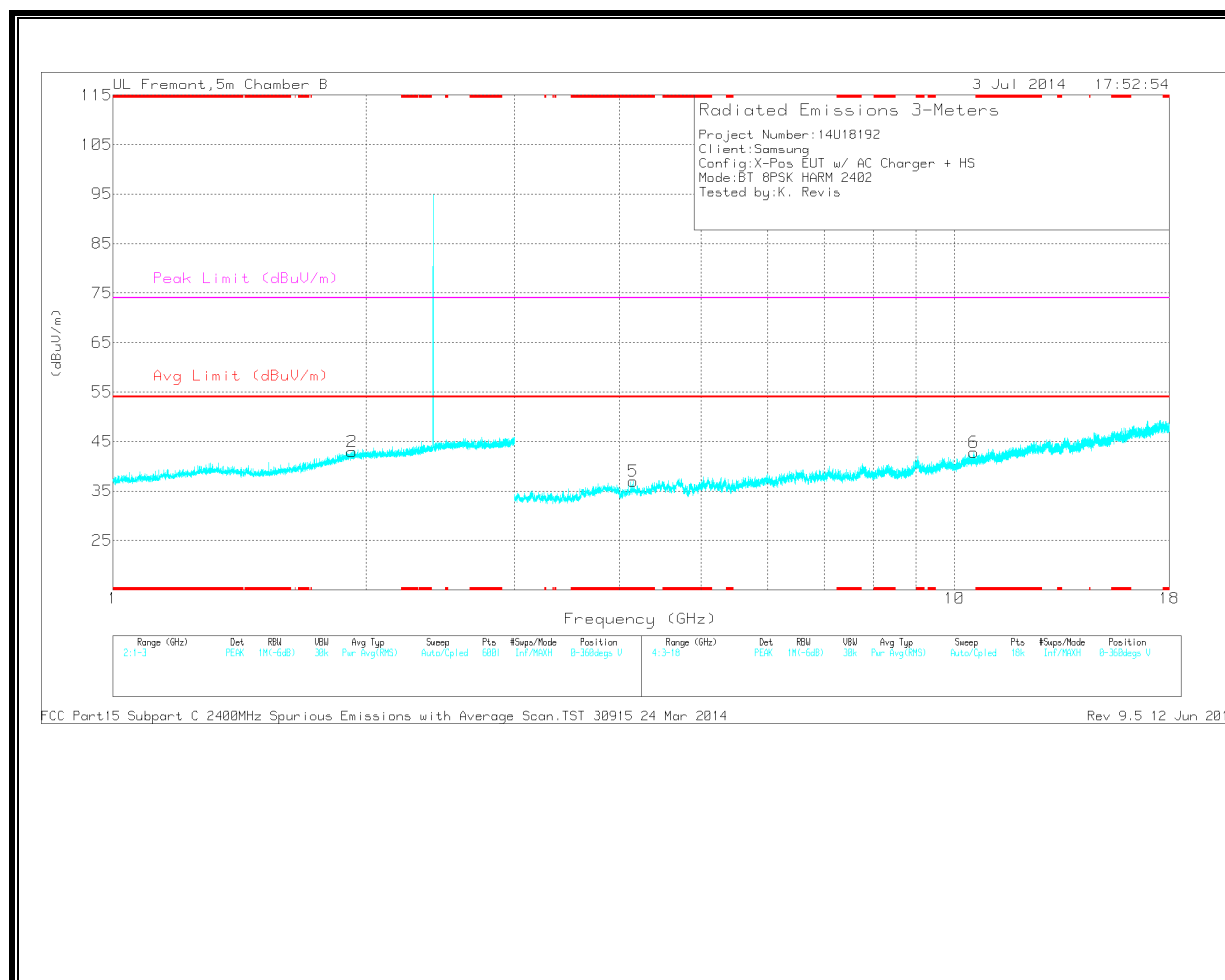
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



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

VERTICAL



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

LOW CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 8.395	30.79	PK	35.8	-25.2	0	41.39	-	-	74	-32.61	0-360	99	H
5	* 4.154	33.52	PK	33.6	-30.1	0	37.02	-	-	74	-36.98	0-360	99	V
2	1.923	35.39	PK	31.1	-23.6	0	42.89	-	-	-	-	0-360	99	V
1	2.096	35.86	PK	31.2	-23.3	0	43.76	-	-	-	-	0-360	99	H
3	6.61	32.01	PK	35.7	-27.8	0	39.91	-	-	-	-	0-360	99	H
6	10.538	28.15	PK	37.5	-22.8	0	42.85	-	-	-	-	0-360	99	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

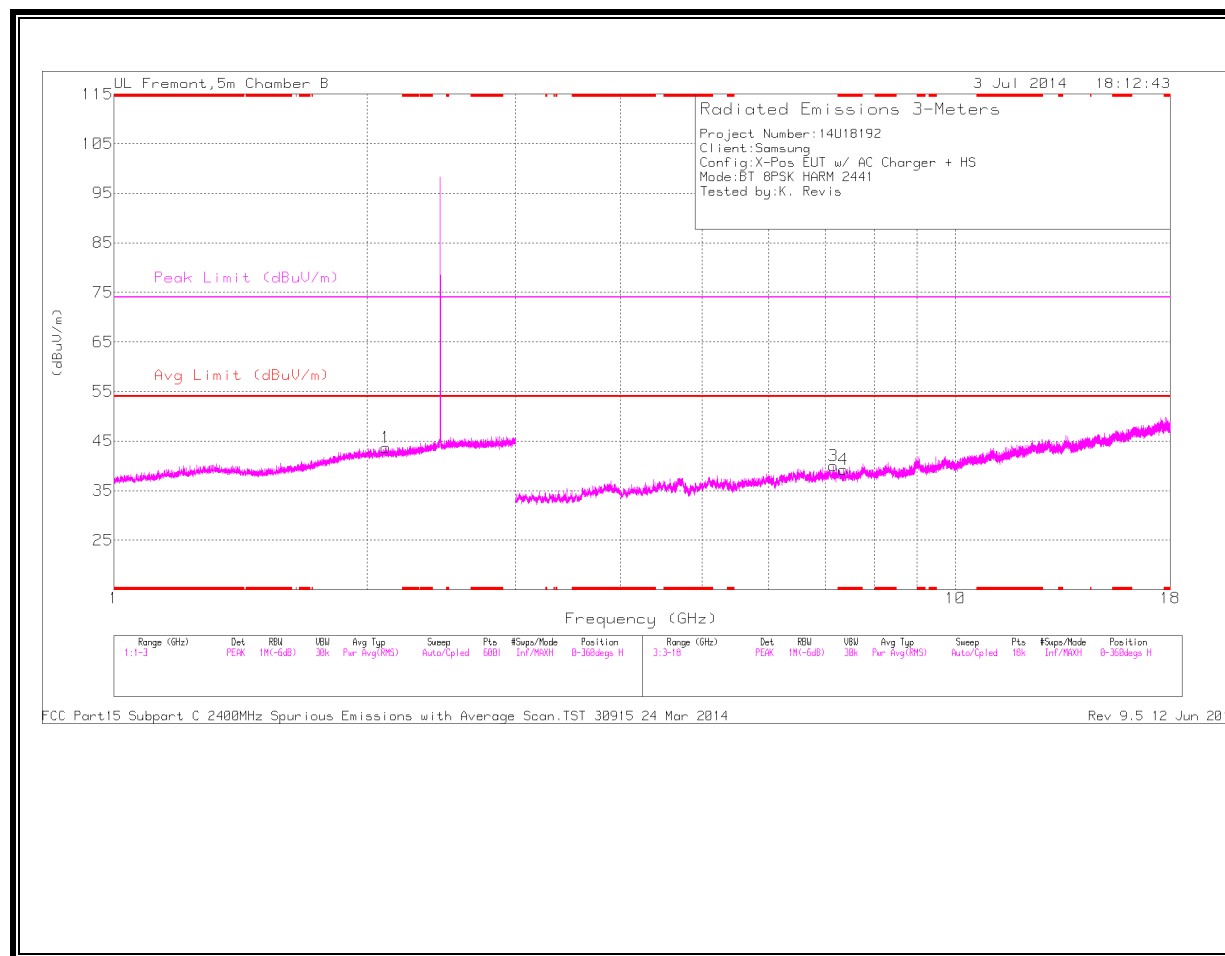
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 8.397	37.51	PK3	35.8	-25.1	0	48.21	-	-	74	-25.79	360	100	H
* 4.154	40.84	PK3	33.6	-30.1	0	44.34	-	-	74	-29.66	360	100	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

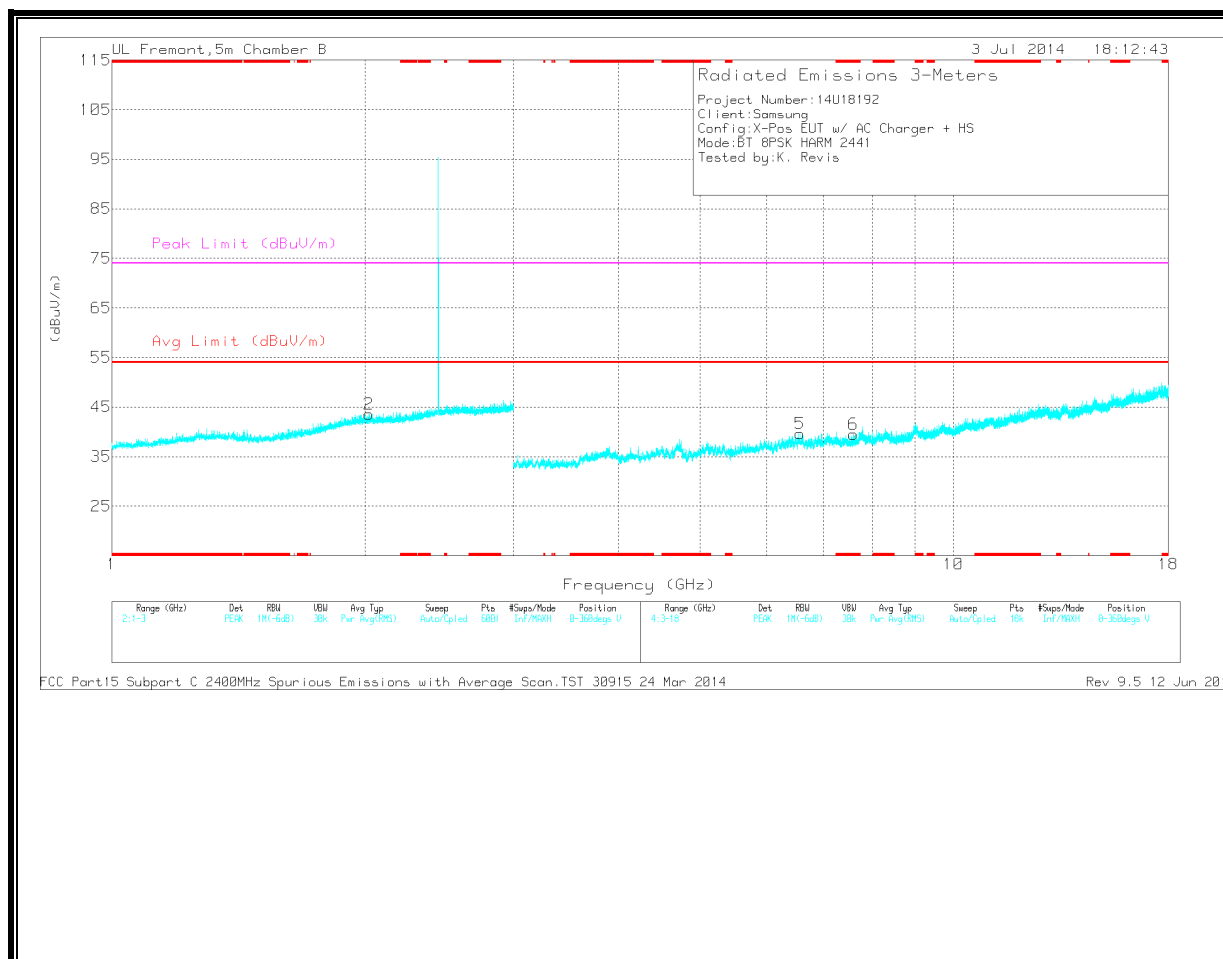
PK3 - FHSS Method: Maximum Peak

MID CHANNEL
HORIZONTAL



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

VERTICAL



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

MID CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 7.356	31.63	PK	35.6	-28	0	39.23	-	-	74	-34.77	0-360	99	H
6	* 7.598	31.16	PK	35.7	-27.4	0	39.46	-	-	74	-34.54	0-360	193	V
2	2.021	35.82	PK	31.3	-23.5	0	43.62	-	-	-	-	0-360	193	V
1	2.107	35.75	PK	31.2	-23.2	0	43.75	-	-	-	-	0-360	99	H
5	6.573	31.81	PK	35.7	-27.9	0	39.61	-	-	-	-	0-360	193	V
3	7.16	31.43	PK	35.6	-27	0	40.03	-	-	-	-	0-360	207	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

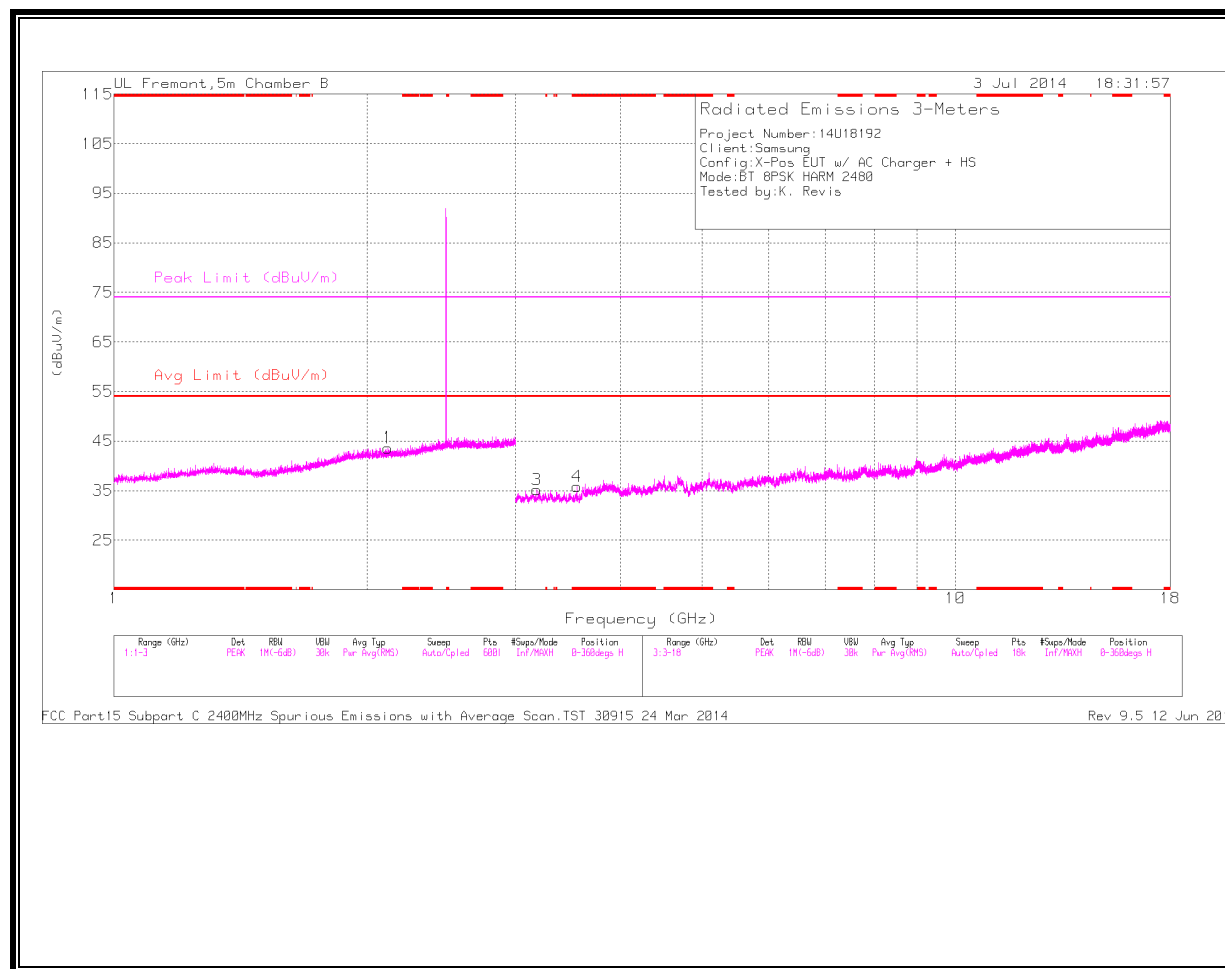
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 7.354	38.57	PK3	35.6	-28	0	46.17	-	-	74	-27.83	359	100	H
* 7.599	38.71	PK3	35.7	-27.4	0	47.01	-	-	74	-26.99	359	199	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

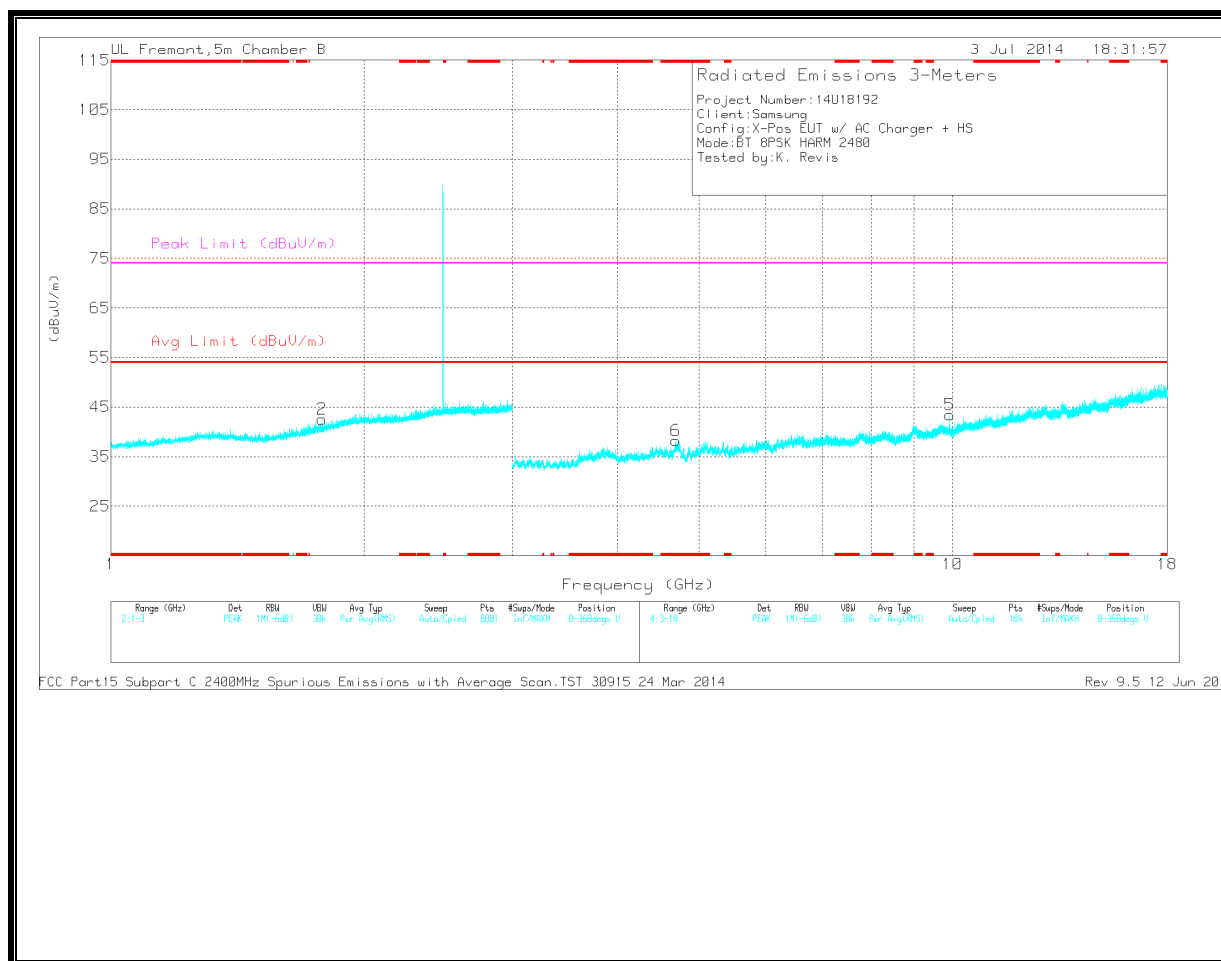
PK3 - FHSS Method: Maximum Peak

HIGH CHANNEL
HORIZONTAL



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

VERTICAL



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

HIGH CHANNEL DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 3.547	34.25	PK	33	-31.4	0	35.85	-	-	74	-38.15	0-360	195	H
6	* 4.687	33.93	PK	34.2	-29.9	0	38.23	-	-	74	-35.77	0-360	99	V
2	1.781	36.16	PK	30	-23.6	0	42.56	-	-	-	-	0-360	99	V
1	2.117	35.53	PK	31.3	-23.2	0	43.63	-	-	-	-	0-360	99	H
3	3.179	33.55	PK	32.8	-31.2	0	35.15	-	-	-	-	0-360	195	H
5	9.92	29.98	PK	37	-23.5	0	43.48	-	-	-	-	0-360	206	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

Radiated Emissions

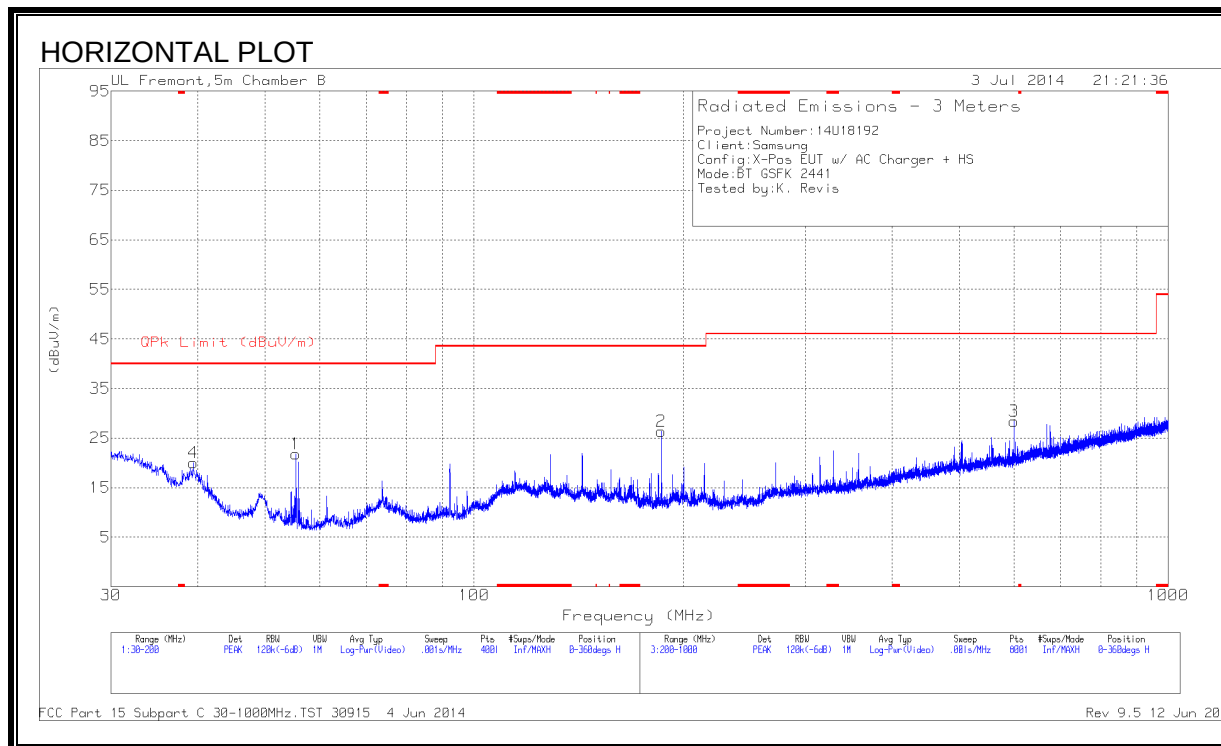
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Ftr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 3.546	41.95	PK3	33	-31.4	0	43.55	-	-	74	-30.45	359	203	H
* 4.688	41.31	PK3	34.2	-29.9	0	45.61	-	-	74	-28.39	359	100	V

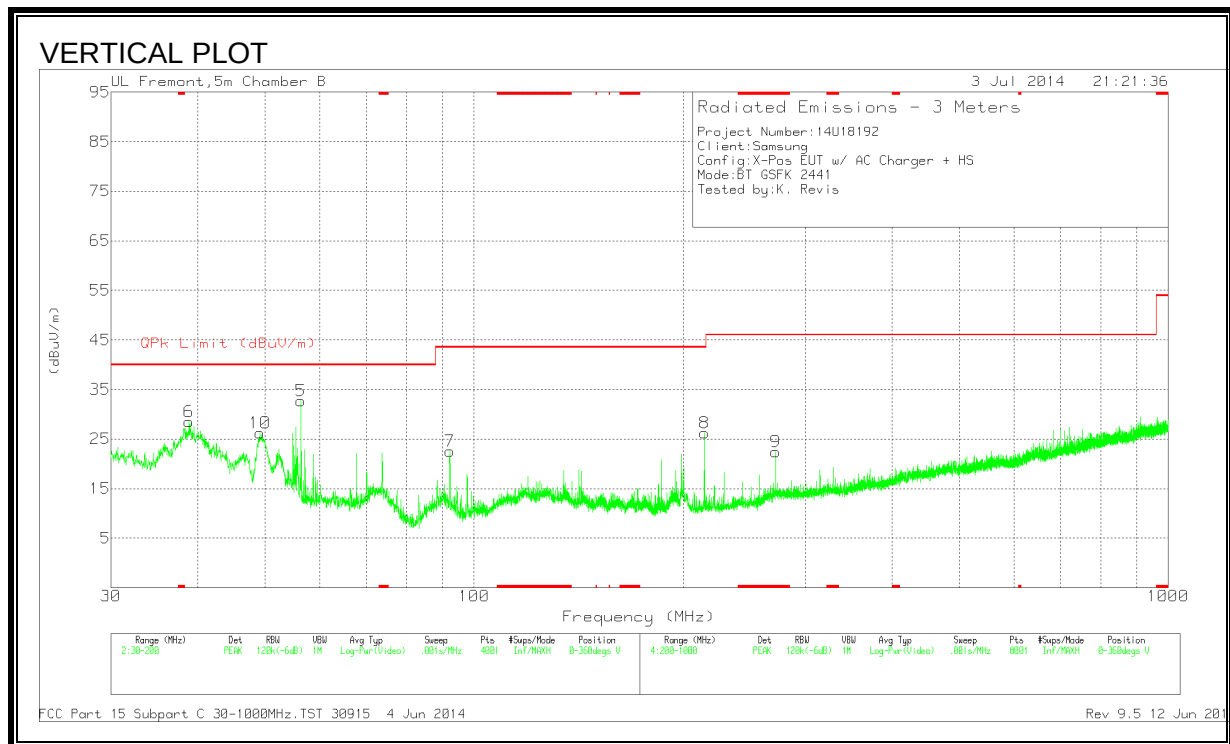
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK3 - FHSS Method: Maximum Peak

9.3. WORST-CASE BELOW 1 GHz

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





DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	* 272.1	35.34	PK	13.3	-26.2	0	22.44	46.02	-23.58	0-360	200	V
6	38.8825	42.41	PK	14.8	-28.7	0	28.51	40	-11.49	0-360	101	V
4	39.3925	34.34	PK	14.4	-28.7	0	20.04	40	-19.96	0-360	200	H
10	49.1675	46.59	PK	8.3	-28.6	0	26.29	40	-13.71	0-360	101	V
1	55.415	43.14	PK	7.2	-28.5	0	21.84	40	-18.16	0-360	300	H
5	56.35	54.01	PK	7.2	-28.5	0	32.71	40	-7.29	0-360	101	V
7	92.3475	42.45	PK	8.2	-28.1	0	22.55	43.52	-20.97	0-360	101	V
2	186.145	42.46	PK	10.9	-27	0	26.36	43.52	-17.16	0-360	100	H
8	214.8	42.38	PK	10.6	-26.8	0	26.18	43.52	-17.34	0-360	200	V
3	600	35.32	PK	18.4	-25.3	0	28.42	46.02	-17.6	0-360	300	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

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

RESULTS

6 WORST EMISSIONS

Line-L1 .15 - 30MHz

Trace Markers										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.681	30.26	PK	.3	0	30.56	56	-25.44	-	-
2	.681	12.12	Av	.3	0	12.42	-	-	46	-33.58
3	.843	35.24	PK	.3	0	35.54	56	-20.46	-	-
4	.843	16.81	Av	.3	0	17.11	-	-	46	-28.89
5	2.094	36.41	PK	.2	.1	36.71	56	-19.29	-	-
6	2.094	13.15	Av	.2	.1	13.45	-	-	46	-32.55
7	4.6635	42.6	PK	.2	.1	42.9	56	-13.1	-	-
8	4.6635	20.16	Av	.2	.1	20.46	-	-	46	-25.54
9	9.4065	28.58	PK	.2	.1	28.88	60	-31.12	-	-
10	9.4065	13.52	Av	.2	.1	13.82	-	-	50	-36.18
11	15.495	40.89	PK	.3	.2	41.39	60	-18.61	-	-
12	15.495	26.84	Av	.3	.2	27.34	-	-	50	-22.66

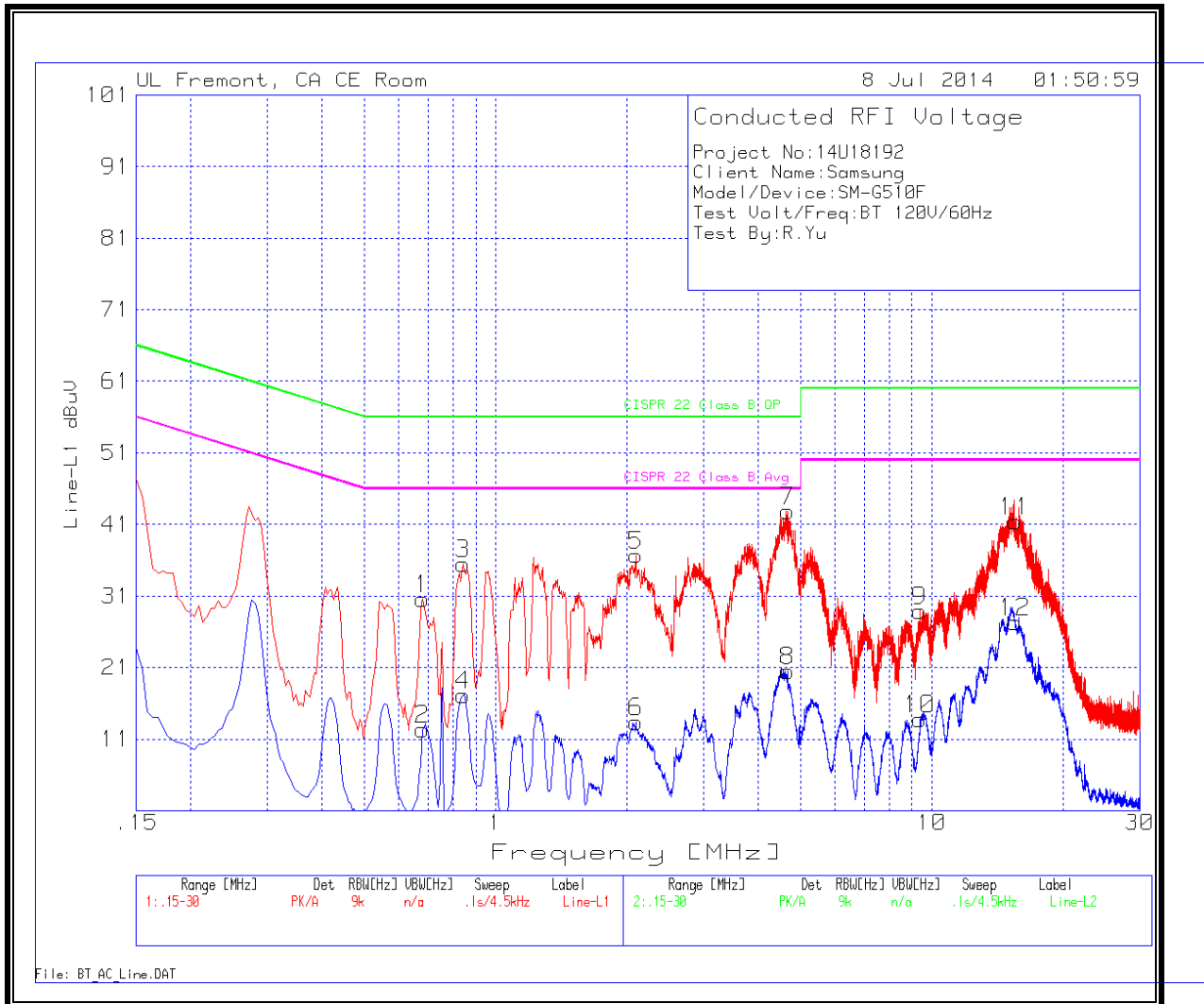
Line-L2 .15 - 30MHz

Trace Markers										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
13	.9555	36.87	PK	.3	0	37.17	56	-18.83	-	-
14	.9555	18.2	Av	.3	0	18.5	-	-	46	-27.5
15	1.374	36.12	PK	.2	.1	36.42	56	-19.58	-	-
16	1.374	15.55	Av	.2	.1	15.85	-	-	46	-30.15
17	2.8095	35.14	PK	.2	.1	35.44	56	-20.56	-	-
18	2.8095	14.69	Av	.2	.1	14.99	-	-	46	-31.01
19	6.1125	33.46	PK	.2	.1	33.76	60	-26.24	-	-
20	6.1125	16.88	Av	.2	.1	17.18	-	-	50	-32.82
21	6.828	26.52	PK	.2	.1	26.82	60	-33.18	-	-
22	6.828	10.96	Av	.2	.1	11.26	-	-	50	-38.74
23	13.56	40.99	PK	.3	.2	41.49	60	-18.51	-	-
24	13.56	20.21	Av	.3	.2	20.71	-	-	50	-29.29

PK - Peak detector

Av - average detection

LINE 1 RESULTS



LINE 2 RESULTS

